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USER'S GUIDE FOR THE AUTOMATED INHALATION EXPOSURE METHODOLOGY (IEM)

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The Inhalation Exposure Methodology(IEM) is a system of computer programs that estimates atmospheric transport of and population exposure to airborne pollutants. This paper discusses the capabilities of IEM and gives detailed instructions for executing the automated, interactive version of IEM that is installed on the IBM system at the National Computer Center, Research Triangle Park, North Carolina. This version uses eight execute (EXEC) programs to assist the user in preparing needed input data files, to direct the flow of input and output data, and to submit the computer programs for execution. Wind speed and direction data contained in Stability Array (STAR) meteorological data files are accessed, prepared, and input to the Industrial Source Complex, Long Term (ISCLT) Dispersion Model. This model is then employed to calculate annual-average ground-level air concentrations of pollutants at specified points. These concentrations and site-specific population data are combined by the Concentration-Exposure Program (CONEX) to provide estimates of population exposures to pollutants. All steps required to execute the interactive version of IEM are explained and demonstrated with the aid of a sample problem.

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FOREWORD

When energy and material resources are extracted, processed, converted, and used, the related pollutional impacts on our environment and even on our health often require new and increasingly more efficient pollution control methods be used. The Industrial Environmental Research Laboratory - Cincinnati (IERL-Ci) assists in developing and demonstrating new and improved methodologies that will meet these needs both efficiently and economically.

This report presents instructions on how to employ an automated methodology for estimating air concentrations, populations, and exposures via the inhalation pathway to pollutants released from industrial complexes. This methodology provides users who access the National Computer Center, Research Triangle Park, North Carolina the ability to perform detailed atmospheric dispersion modeling and analysis with little computer experience. This methodology is valuable to both experienced atmospheric dispersion modelers/researchers who do not have automatic access to population or meteorological data and policy makers who, although they may have only limited computer science or atmospheric dispersion modeling backgrounds, are required to develop population exposure estimates that can be substantiated. For further information on this methodology, the Incineration Research Branch of the Energy Pollution Control Division should be contacted.

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ABSTRACT

The Inhalation Exposure Methodology(IEM) is a system of computer programs that estimates atmospheric transport of and population exposure to airborne pollutants. This paper discusses the capabilities of IEM and gives detailed instructions for executing the automated, interactive version of IEM that is installed on the IBM system at the National Computer Center, Research Triangle Park, North Carolina. This version uses eight execute (EXEC) programs to assist the user in preparing needed input data files, to direct the flow of input and output data, and to submit the computer programs for execution. Wind speed and direction data contained in Stability Array (STAR) meteorological data files are accessed, prepared, and input to the Industrial Source Complex, Long Term (ISCLT) Dispersion Model. This model is then employed to calculate annual-average ground-level air concentrations of pollutants at specified points. These concentrations and site-specific population data are combined by the Concentration-Exposure Program (CONEX) to provide estimates of population exposures to pollutants. All steps required to execute the interactive version of IEM are explained and demonstrated with the aid of a sample problem.

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SECTION 1

INTRODUCTION

The Inhalation Exposure Methodology (IEM) is a system of computer programs that estimates atmospheric transport of and population exposure to airborne pollutants. It was developed to provide automatic access to population and meteorological data for employment in a sophisticated but user-friendly atmospheric dispersion modeling methodology. Although results of IEM can be applied to a number of different problems, its principal aim is estimating air pollution concentrations and human inhalation exposures in the vicinity of hazardous waste incineration facilities. In particular, it has been used for making comparisons of the effectiveness of different pollution control techniques and of the relative importance of different sources of facility emissions. IEM employs current models that were chosen to balance rigorous estimation techniques with use of readily available data. It produces tables of annual-average ground-level air concentrations, population distributions, and population exposures via inhalation for pollutants emitted from industrial sources.

This guide contains a brief description and detailed instructions for running an interactive version of IEM that has been implemented on the IBM system at the National Computer Center, Research Triangle Park, North Carolina. IEM was installed for use by contractors and staff of the U.S. Environmental Protection Agency. Persons wishing to use this version of IEM should contact their Project Officers to arrange access to the IBM system, IEM programs, and data files.

IEM consists of four groups of computer programs called MET, POP, ISCLTM, and CONEX. Sections 2 through 6 explain functions, interactions, input requirements, output capabilities, and execution instructions for each program. To simplify discussion, the various computer programs, input data files, and output files are identified by symbolic names rather than by the lengthy identifiers used in the IBM system (except for a few output files, a general user does not need to know the system identifiers). Section 7, supplemented by Appendices D and E, illustrates the use of and output from IEM for a sample problem. Interactive operations that will enable an inexperienced user to run IEM are explained in Appendix A. Details of modifications made to the atmospheric dispersion model employed by IEM are given in Appendix B. A checklist of the input variables needed to run each step of IEM is given in Appendix C.

As in the case of all dispersion models, results obtained from IEM are functions of the input and of the computing algorithms. Uncertainties are involved in quantifying any input requirements. For example, the accuracy of dispersion model input data (e.g. emission rates and stack gas conditions) will influence the certainty to which air concentrations are determined. Furthermore, although region-specific meteorological data are provided by IEM for locations across the contiguous United States, such data may be different and not as representative as meteorological data that could be obtained from on-site observations. Population estimates are computed from 1980 Census information which do not reflect detailed housing locations. Consequently, differences in population location occur between IEM and actual values because of numerical and computational constraints. Placing a numerical bound on the effect such uncertainties make is a difficult activity and dependent on the site or facitity studied. IEM is designed to be a

methodology for computing exposures for input into assessment studies. Activities where detailed site-specific information is possibly needed should not apply IEM-provided data without some caution concerning these uncertainties.

In general, the flow of IEM (Fig. 1.1) is controlled by eight executive (EXEC) programs which must be run in proper sequence. Each EXEC program contains appropriate job control and program statements to access system-stored data files and programs, direct the user in preparation of a problem-specific input data file, submit the programs for execution on the IBM system, and process program outputs. The EXEC programs and computer programs are not discussed in detail; only the information needed to run them is given.

Operation of the MET program group (Sect. 2) is controlled by EXEC0, EXEC1, and EXEC2. This program group produces a semi-permanent data set that contains wind speed and direction meteorological data required by the atmospheric dispersion program. Operation of the POP program group (Sect. 3) is controlled by EXEC3 and EXEC4. This group produces a data file that contains population data required in a later step to estimate exposures. Operation of ISCLTM (Sect. 4) is controlled by EXEC6 and EXEC7. EXEC6 assists the user in preparing the remaining input data needed by the atmospheric dispersion program, a slightly modified version of the Industrial Source Complex, Long-Term (ISCLT) Dispersion Model.[1] Users of IEM should be familiar with the ISCLT user's guide.[1] EXEC7 executes the modified version of ISCLT, called ISCLTM, as described below. Operation of CONEX (Sect. 5) involves EXEC5 and EXEC7. EXEC5 assists the user in producing a file that defines which output population, concentration, and exposure tables will be prepared by the concentration-exposure program (CONEX). EXEC7 (Sect. 6) gathers the previously created input data files and submits both the atmospheric dispersion program and the concentration-exposure program to the IBM system for execution.

Although use of IEM is illustrated in sequential steps, it is not necessary to follow the indicated order for all EXEC programs. The EXEC programs used by a program group must be run in sequence (i.e., EXEC2 requires the output from EXEC1 which requires the output from EXEC0, and EXEC4 requires the output from EXEC3). The EXEC programs used by other program groups can be run while waiting for one of the sequential EXEC programs to execute. For example, while waiting for EXEC0 to execute, the user can run EXEC3, EXEC5, or EXEC6. EXEC7 must be be run last because it requires the output from EXEC2, EXEC4, EXEC5, and EXEC6.

Before beginning an IEM session, the user should become familiar with input requirements of the various programs and should:

1. define the latitude and longitude (in degrees, minutes, and seconds) of the origin (source location) of the coordinate systems to be used (see below);
2. define the grid coordinate system -- a polar coordinate system that locates the points at which ground-level air concentrations are to be calculated (see below);
3. define the centroid coordinate system -- a polar coordinate system that locates the centroids of the segments (areas) over which average ground-level air concentrations and population exposures are to be calculated (see below);
4. decide how to represent the pollutant emission sources (Sect. 4, 5, and 7);
5. assemble the input data required by the atmospheric dispersion program (Sect. 4), and

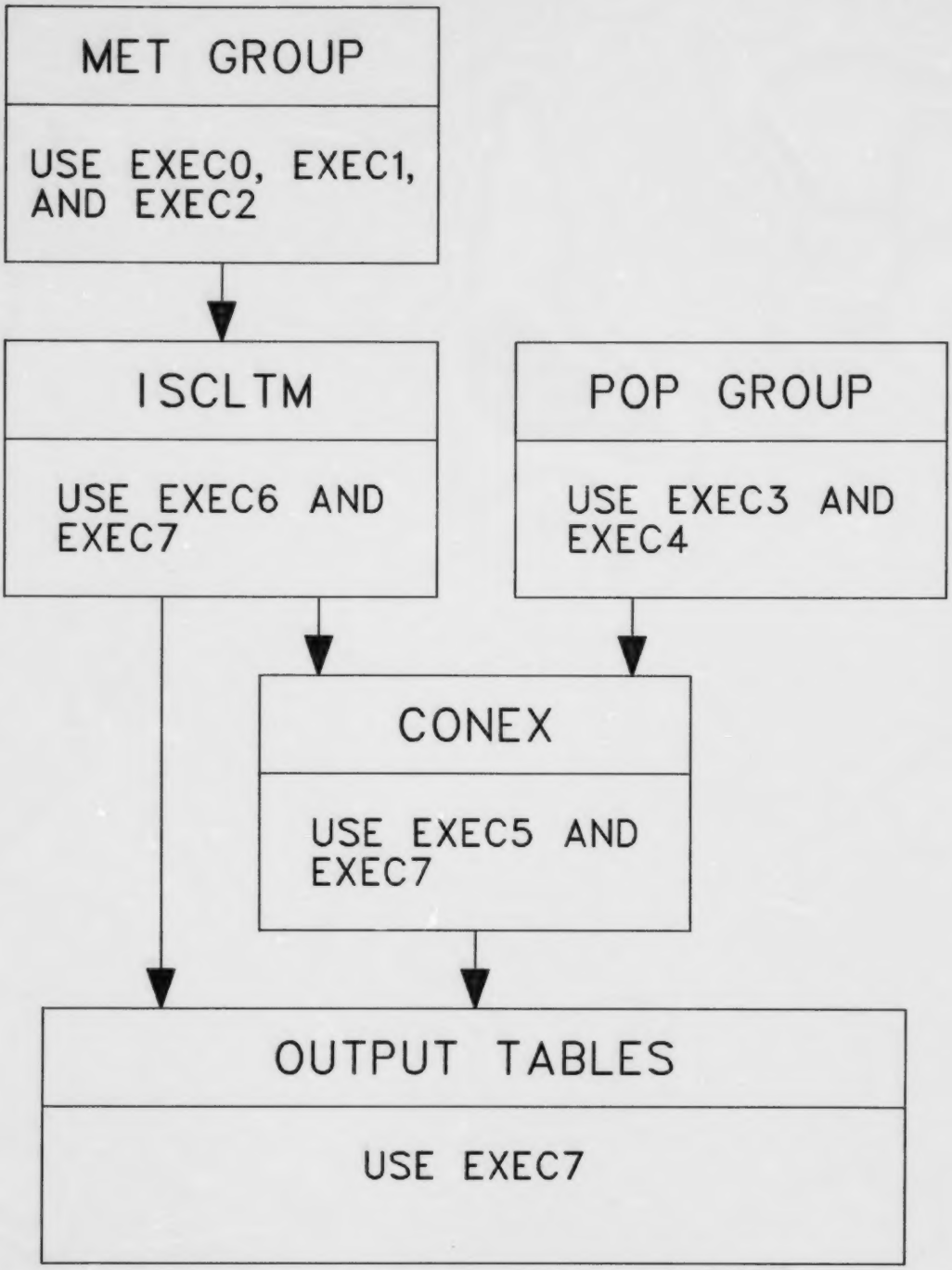

Figure 1.1. Schematic representation of program group interactions in IEM and their use of executive programs.

6. assemble the input data required by the concentration-exposure program (Sect. 5).

IEM uses two polar coordinate systems (the "grid" and "centroid" systems) which have a common origin. Both systems are characterized by a set of radial distances, one to each of several rings circumscribed about the origin, and a set of 16 equally spaced direction vectors, represented by a set of 16 angles.

Although several relative orientations of the two coordinate systems can be chosen, the one shown in Figure 1.2 is used in IEM. In this orientation, both systems have the same direction vectors (D1-D16) which are represented by angles A1-A16, where A1=0° and each successive angle is 22.5° greater than the previous one. The rings of the centroid system (RC1, RC2, ...) are represented by their radial distances from the origin (XC1, XC2, ...). They are located midway between adjacent rings of the grid system (RG1, RG2, RG3, ...), which are represented by distances XG1, XG2, XG3, etc. In this orientation, RC1 is located between RG1 and RG2; RC2 between RG2 and RG3; etc. Thus, there must always be one more grid ring (maximum of 20) than there are centroid rings (maximum of 19). Also note that the area inside RG1, which is usually the source (plant) boundary, is excluded from the centroid system.

In the grid system, intersections of direction vectors and radial rings are points [e.g., PG(1,1)] at which ISCLTM calculates annual-average ground-level air concentrations. In the centroid system, points of intersection [e.g., PC(1,1)] are centroids of sector segments (areas) at which ISCLTM air concentrations are averaged for employment in calculating exposure estimates. Each sector segment is bounded by superimposed direction vectors located ±11.25° from the true direction vector and the two nearest grid rings. The shaded area in Figure 1.2 shows the sector segment represented by centroid point PC(9,2). This point is located on direction D9 (180°) and ring RC2 (distance XC2 from origin). The corresponding sector segment occupies the area bounded by directions 168.75° and 191.25° and grid rings RG2 and RG3 (distances XG2 and XG3 from origin). The average concentration within this sector segment (e.g., PC(9,2)) is calculated from concentrations at the radial grid rings which bound the sector segment (e.g., PG(9,2) and PG(9,3)). A population estimate representing all people living within the sector segment is also assigned to point PC(9,2). The product of the population and concentration at that point is the estimated exposure in that sector segment.

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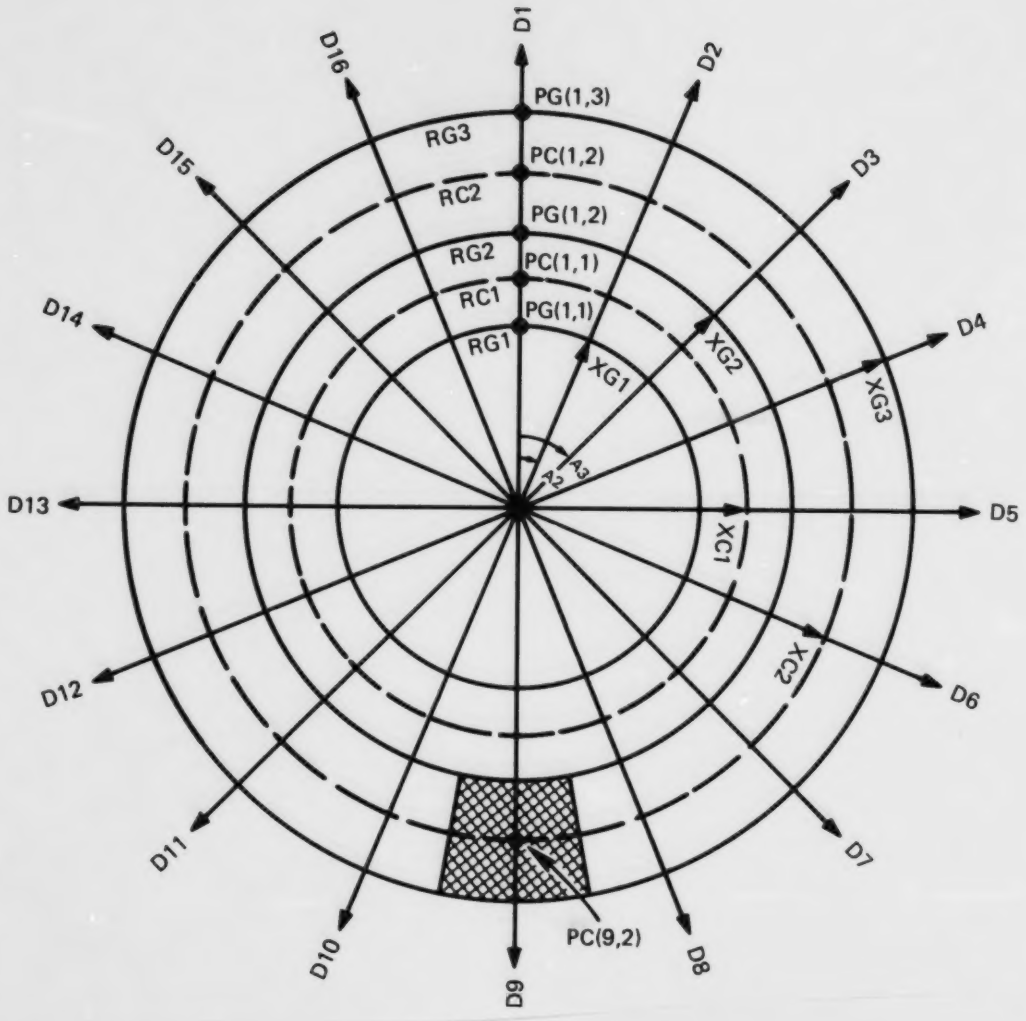

Figure 1.2. Orientation of the grid and centroid systems used in IEM (see explanation in text).

SECTION 2

THE MET GROUP

2.1 INTRODUCTION

The MET group (Fig. 2.1) is a series of three programs (SERCH, DIREC, and STAR), each of which performs one step in obtaining part of the meteorological data needed for ISCLTM, namely, the joint frequency of occurrence by Pasquill stability category of wind speed and direction. To use the MET group, the user needs to know the location (latitude and longitude) of the origin of the coordinate systems. The following subsections describe how to use each program.

2.2 SERCH

The SERCH program locates and identifies meteorological stations near the source. Either of two methods may be used for station location: (1) by latitude-longitude window or (2) by state. Input to, operation of, and output from SERCH is controlled by the executive program named EXEC0. Section 7 and Step 1 of Appendix D illustrate the use of EXEC0. To use EXEC0, follow operation A.I.1 in Appendix A.

2.2.1 Input Requirements

Input to SERCH is from the interactively created (by the user) file SERCH.INP and the permanently stored file SERCH.DAT. The contents of SERCH.INP depend on the chosen method of station location. In general, location by latitude-longitude window is the better method.

2.2.1.1 Location By Latitude-Longitude Window

This approach requires the user to specify a window that contains the source. An easy way to do this is to add and subtract one or two degrees from the latitude and longitude of the origin of the coordinate systems (which should be identified before beginning the IEM session). EXEC0 will ask the user to supply:

1. a two-digit integer value for OPTION which must be 00 to activate the window option;
2. four-digit integer (the first two representing degrees; the next two, minutes) values of LATLO and LATHI, the lower and upper bounds, respectively, of the latitude window; and
3. five-digit integer (the first three representing degrees; the next two, minutes) values of LONLO and LONHI, the lower and upper bounds, respectively, of the longitude window.

Failure to enter all digits will cause EXEC0 to repeat the prompt that indicates which variable is to be entered. (Longitude values less than 100° must be preceded by 0, e.g., 84° 15' should be entered as 08415.)

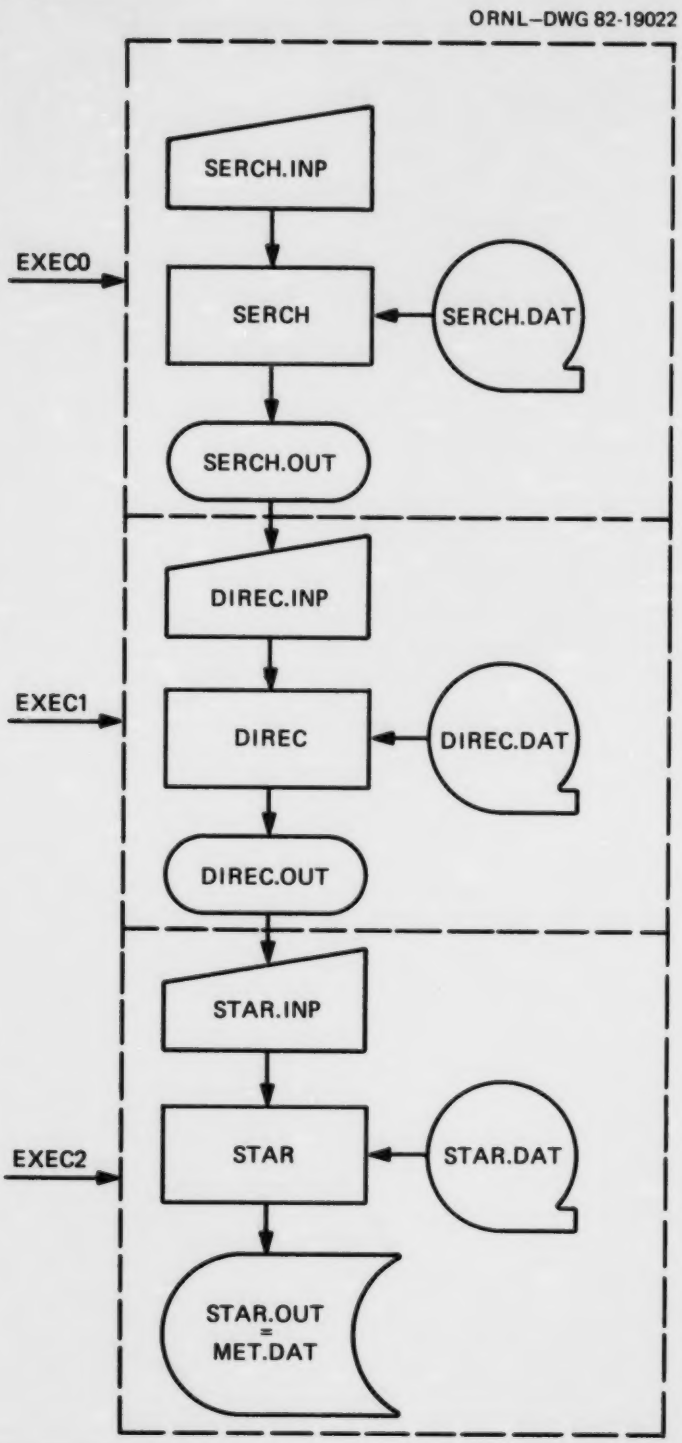

Figure 2.1. Schematic representation of input and output data flow and program control in the MET program group.

2.2.1.2 Location By State

Location by state requires the user to enter the Federal Information Processing Standards (FIPS) code for the state chosen (see Table 2.1). This two-digit code number should be entered when EXEC0 asks for an OPTION value. Note, one digit code numbers are invalid.

2.2.2 Output

SERCH produces a file named SERCH.OUT which lists the following for each meteorological station located in the chosen latitude-longitude window or state:

1. five-digit station number,
2. city/station name,
3. state,
4. latitude (degrees, minutes),
5. longitude (degrees, minutes), and
6. state FIPS code.

The total number of stations found is also given. The user should select stations of interest and record their station numbers.* To read SERCH.OUT, the user should:

1. Record the job number (e.g., *abcd*) assigned to the run by the system in the last line of the EXEC0 session (i.e., JOB *abcd jobname* SUBMITTED).

2. Determine if the job has executed by responding LOCATE or LOC to the COMMAND? prompt. If the job has executed, the system will respond:

   JOB *abcd jobname* AW FETCH.

   If the job has not executed, the system will respond:

   JOB *abcd jobname* AW EXEC c=*x* POS=*xx* PRI=*xx*.

3. Read the output after the job has executed using the following command string (user responses are italicized lower-case characters throughout this report):

   COMMAND? *fetch abcd*

   OK TO CLEAR? *ok*

   COMMAND? *l 'printout'*

   LINE#1. FORMAT('*****PRINTOUT BEGINS HERE*****)

   LINE#2. *****PRINTOUT BEGINS HERE*****

   COMMAND? *l line#2/end*

   (Listing of SERCH.OUT file.)

After recording the desired station numbers or, at the latest, when completing the MET program runs, this job *abcd* should be purged from the system using operation A.I.5.

---

* See Section 2.3.2.

Table 2.1. Listing of states and corresponding code numbers assigned for Federal Information Processing Standards (FIPS)

State	FIPS Code	State	FIPS Code
AL	01	MT	30
AK	02	NB	31
AZ	04	NV	32
AR	05	NH	33
CA	06	NJ	34
CO	08	NM	35
CT	09	NY	36
DE	10	NC	37
LF	12	ND	38
GA	13	OH	39
HI	15	OK	40
ID	16	OR	41
IL	17	PA	42
IN	18	RI	44
IA	19	SC	45
KS	20	SD	46
KY	21	TN	47
LA	22	TX	48
ME	23	UT	49
MD	24	VT	50
MA	25	VA	51
MI	26	WA	53
MS	28	WV	54
MO	29	WI	55
		WY	56

2.3 DIREC

The DIREC program supplies the information about the stations of interest that is needed to select and retrieve the desired meteorological data set. (Several data sets may be available for a station). Input to, operation of, and output from DIREC is controlled by the executive program named EXEC1. Step 2 of Appendix D illustrates the use of EXEC1, which is enabled by operation A.I.1.

2.3.1 Input Requirements

Input to DIREC is from the interactively created (by the user) file DIREC.INP and the permanently stored file DIREC.DAT. EXEC1 will ask the user to supply (1) the number of stations desired as a five-digit integer number (e.g., 2 = 00002) and (2) the five-digit integer identification number, in ascending order, of each station. This information is obtained from SERCH.OUT, which was described in Section 2.2. (See Sect. 7 and Appendix D for an example).

2.3.2 Output

DIREC produces DIREC.OUT which lists, for each STAR data set pertaining to the selected stations, the following information:

1. a unique header number (HDR) for the STAR data set;
2. STATION number;
3. city/station name;
4. state abbreviation;
5. time period covered (YRS), year/month - year/month;
6. type of data (PER), M/S/A (monthly, seasonal, or annual);
7. number of stability classes (STAB CLASS) in the data set;
8. DAYNITE indicator (DN or blank);
9. number of the first record occupied by the data set (NSTART),
10. number of records in the data set (NREC); and
11. FILE NUMBER on the STAR data tape.

The user should select the data set of interest and record NSTART, NREC, STATION, HDR, STAB CLASS, presence or absence of DN for DAYNITE, PER value, and FILE NUMBER. It is recommended that data selected should be as representative of the studied site as possible and for the longest duration available. This means that data for a close-in airport might be preferable to that of a weather station 100 miles away and that data gathered over a five-year period would be preferable to data for one year. For further information concerning selection of appropriate meteorology, users should consult with a professional meteorologist.

To read DIREC.OUT, the user should follow the procedure for reading SERCH.OUT (Sect. 2.2.2). This job should also be purged after recording the needed information.

2.4 STAR

The STAR.IBM program reads the user-selected STAR data set (Sect. 2.3.2) and writes the meteorological data file required by the atmospheric dispersion program (Sect. 4). Input to, operation of, and output from STAR is controlled by the executive program named EXEC2. Step 3 of Appendix D illustrates the use of EXEC2, which is enabled by operation A.I.1.

2.4.1 Input Requirements

Input to STAR is from the interactively created (by the user) data set STAR.INP and the permanently stored file STAR.DAT. The needed input data should have been recorded from DIREC.OUT (Sect. 2.3.2). EXEC2 will ask the user to supply:

1. a six-digit integer value for NSTART, the starting record number of the selected STAR file;
2. a six-digit integer value for NREC, the number of records in the file;
3. the five-digit integer station number (STATION);
4. the four-digit integer header number (HDR);
5. a one-digit integer stability class number (STAB CLASS);
6. a 1 if DN is indicated or 0 if it is not;
7. a two-digit integer value representing the PER value (M/S/A), which should be a month number (01-12), season number (13-16 for spring, summer, fall, or winter), or 17 for annual data; and
8. the one-digit integer FILE NUMBER.

2.4.2 Output

STAR writes a semi-permanent (deleted by the computer system after a certain length of time) data set (MET.DAT in Figure 2.1) containing the joint frequency of occurrence by Pasquill stability category of wind speed and direction for the selected data set. This file will contain data only for the month, season, or year selected in item 7 Sect. 2.4.1. This file is written in the format required by the atmospheric dispersion code and is named H*wxyzab*, where *wxyz* represents the four-digit value of HDR and *ab* represents the two-digit PER value. This file is called in EXEC7 using *wxyzab*. Although not necessary, the user can read H*wxyzab* with operations A.II.1 and A.I.4. The job created by EXEC2 can be deleted without destroying the data file.

SECTION 3

THE POP GROUP

3.1 INTRODUCTION

The POP group (Fig. 3.1) consists of two programs (RD80 and APORT), each of which performs one step in producing the population data needed by CONEX. To use this group, the user must know the location (latitude and longitude) of the origin of the coordinate system; the radial distance (km) to the outermost ring of the grid coordinate system; the name of the fine grid data set, if a fine grid population data set is to be used; the number of rings that define the grid coordinate system; and the radial distance (km) to each ring. The following subsections describe how to use both programs.

3.2 RD80

The RD80 program transfers grid-recorded 1980 census population data into a format suitable for use by APORT. Input to, operation of, and output from RD80 is controlled by the executive program named EXEC3. Step 4 of Appendix D illustrates the use of EXEC3 for the sample problem.

The population data used by RD80 are contained in several permanently stored data files. The main file, RD80.DAT1, contains estimates of the number of persons (1980 census) in each rectangle of a 0.1°−latitude × 0.1°−longitude matrix. For a latitude of 36°, this rectangle would have dimensions of 11.1 by 9.01 km (dimensions change with latitude due to curvature of the Earth). In assigning persons to the rectangles, the entire population of an enumeration district is assigned to a rectangle if the physical center of gravity of the district falls within the rectangle. This procedure can produce a distorted population distribution in densely or sparsely populated areas. To alleviate this problem in densely populated areas, several city-specific data files, RD80.DAT2, are available (see Table 3.1). These data sets assign enumeration-district populations into rectangles defined by a 2'−latitude × 2'−longitude (3.70 by 3.00 km at 36° latitude) matrix.

3.2.1 Input Requirements

Input to RD80 is from the interactively created (by the user) data file RD80.INP and the permanently stored data files RD80.DAT1 and RD80.DAT2. EXEC3 will ask the user to supply:

1. a six-digit integer value (the first two representing degrees; the next two, minutes; and the last two, seconds) for the latitude of the origin;
2. a seven-digit integer value (the first three representing degrees; the next two, minutes; and the last two, seconds) of the longitude of the origin;
3. an unspecified, left-adjusted decimal value (be sure to include the decimal point) for the radial distance (km) to the outermost grid ring;

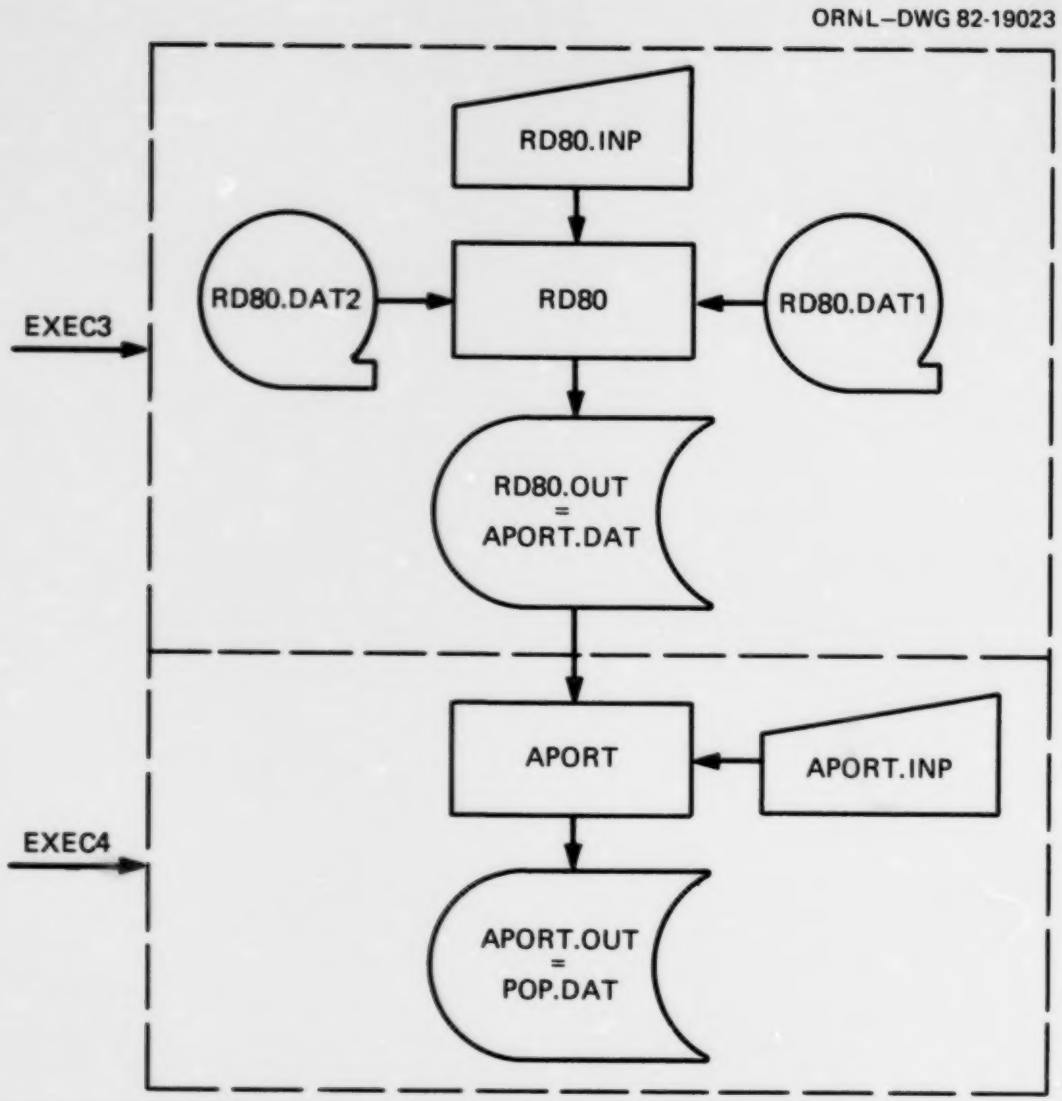

Figure 3.1. Schematic representation of input and output data flow and program control in the POP program group.

Table 3.1. Cities, file numbers and names, and locations of fine-grid population areas

City and state	File		Extent of grid			
			Southeast corner		Northwest corner	
	Number	Name	Latitude	Longitude	Latitude	Longitude
Detroit, MI	1	DETROIT	41° 38'	82° 14'	42° 58'	83° 46'
Boston, MA	2	BOSTON	41° 44'	70° 20'	42° 52'	71° 40'
Houston, TX	3	HOUSTON	29° 14'	94° 20'	30° 10'	95° 46'
St. Louis, MO	4	ST.LOUIS	38° 02'	89° 32'	39° 04'	90° 46'
Baltimore, MD	5	BALTIMOR	38° 50'	76° 02'	39° 40'	77° 04'
Newark, NJ	6	NEWARK	40° 02'	73° 20'	41° 22'	74° 58'
Cleveland, OH	7	CLEVELND	40° 50'	80° 56'	42° 04'	82° 22'
San Diego, CA	8	SANDIEGO	32° 08'	116° 32'	33° 10'	117° 40'
Miami, FL	9	MIAMI	25° 08'	79° 32'	26° 16'	80° 46'
New Orleans, LA	10	NORLEANS	29° 20'	89° 26'	30° 28'	90° 34'
Milwaukee, WI	11	MILWAUKE	42° 14'	86° 56'	43° 40'	88° 46'
Austin/San Antonio, TX	12	AUSTIN.SANANTON	28° 44'	96° 56'	30° 52'	99° 22'
Seattle/Tacoma, WA	13	SEATTLE.TACOMA	46° 32'	121° 14'	48° 10'	123° 22'
Buffalo, NY	14	BUFFALO	42° 26'	78° 20'	43° 16'	79° 22'
Kittery, ME	15	KITTERY	42° 44'	70° 20'	43° 22'	71° 04'
Newport News, VA	16	NEWPNEWS	36° 26'	75° 50'	37° 22'	76° 52'
Groton, CT	17	GROTON	41° 02'	71° 44'	41° 34'	72° 22'
Norfolk, VA	18	NORFOLK	36° 20'	75° 38'	37° 16'	76° 40'
Charleston, SC	19	CHARLSTN	32° 20'	79° 26'	33° 10'	80° 22'
Schenectady, NY	20	SCHECTDY	42° 20'	73° 20'	43° 16'	74° 28'
Albuquerque, NM	21	ALBUQRQE	34° 38'	106° 12'	35° 22'	107° 04'
Birmingham, AL	22	BIRMNGHM	33° 02'	86° 18'	33° 52'	87° 16'
Charlotte, NC	23	CHARLTTE	34° 50'	80° 18'	35° 34'	81° 10'
Cincinnati, OH	24	CINTI	38° 38'	83° 56'	39° 28'	84° 58'
Columbus, OH	25	COLUMBUS	39° 32'	82° 26'	40° 22'	83° 28'
Denver, CO	26	DENVER	39° 20'	104° 32'	40° 04'	105° 22'
Pittsburgh, PA	27	PITTSBRG	39° 50'	79° 20'	40° 52'	80° 34'
New York, NY	28	NEWYORK	39° 50'	72° 56'	41° 28'	74° 58'

Table 3.1. (Continued)

City and state	File		Extent of grid			
			Southeast corner		Northwest corner	
	Number	Name	Latitude	Longitude	Latitude	Longitude
Chicago, IL	29	CHICAGO	41° 14'	86° 50'	42° 28'	88° 22'
Washington, DC	30	WASHTNDC	38° 20'	76° 26'	39° 22'	77° 34'
Philadelphia, PA	31	PHILDLPH	39° 14'	74° 20'	40° 34'	75° 52'
Los Angeles, CA	32	LOSANGEL	33° 14'	117° 20'	34° 46'	119° 04'
Atlanta, GA	33	ATLANTA	33° 14'	83° 50'	34° 10'	84° 52'
Dallas, TX	34	DALLAS	32° 20'	96° 20'	33° 10'	97° 10'
Minneapolis/St. Paul, MN	35	MINNSTPL	44° 26'	92° 26'	45° 22'	93° 40'
San Francisco, CA	36	SANFRAN	37° 08'	121° 44'	38° 16'	123° 04'
El Paso, TX	37	ELPASO	31° 26'	106° 02'	32° 04'	106° 46'
Fort Worth, TX	38	FTWORTH	32° 14'	96° 50'	33° 10'	97° 46'
Indianapolis, IN	39	INDIANAP	39° 20'	86° 14'	40° 04'	87° 10'
Jacksonville, FL	40	JACKSONV	29° 56'	81° 14'	30° 40'	81° 58'
Kansas City, KS	41	KANSASCY	38° 44'	94° 14'	39° 22'	94° 58'
Louisville, KY	42	LOUISVIL	37° 50'	85° 14'	38° 34'	86° 10'
Memphis, TN	43	MEMPHIS	34° 38'	89° 32'	35° 28'	90° 28'
Nashville, TN	44	NASHVILL	35° 44'	86° 20'	36° 28'	87° 10'
Oklahoma City, OK	45	OKLAHCTY	34° 56'	97° 02'	35° 52'	97° 58'
Omaha, NB	46	OMAHA	40° 56'	95° 32'	41° 34'	96° 16'
Phoenix, AZ	47	PHOENIX	33° 02'	111° 32'	33° 52'	112° 22'
Portland, OR	48	PORTLAND	45° 02'	123° 08'	45° 52'	124° 04'
San Jose, CA	49	SANJOSE	36° 56'	121° 26'	37° 40'	122° 16'
Toledo, OH	50	TOLEDO	41° 14'	83° 08'	41° 58'	83° 52'
Tulsa, OK	51	TULSA	35° 42'	95° 32'	36° 28'	96° 16'
Tucson, AZ	52	TUCSON	31° 50'	110° 32'	32° 34'	111° 22'
Greenville, NC	53	GREENVLL	34° 26'	82° 02'	35° 04'	82° 40'
Shreveport, LA	54	SHREVEPT	32° 08'	93° 20'	32° 46'	94° 04'

4. a yes (Y) or no (N) answer for the existence of a fine-grid (2' × 2') data set;
5. the name of the fine-grid data set (from Table 3.1), if applicable; and
6. an eight-character, or smaller, name for the output file.

3.2.2 Output

RD80 produces the semi-permanent data file RD80.OUT, which is also called APORT.DAT because it is called by EXEC4 to supply input data needed by APORT. The user has no need to examine this file but may do so by using operations A.II.1 and A.I.4 for a file named POP.GRID. (*name given in item 6 of Sect. 3.2.1*). Purging the job created by EXEC3 will not affect the data file.

3.3 APORT

APORT is an adaptation of a computer code written by Fields and Little.[2] It estimates the population in each segment of the centroid coordinate system using the population rectangles provided by RD80. This is done by superimposing the array of segments on the array of rectangles, then determining which rectangles are intersected by each segment. The number of persons in each segment is then calculated from:

$$P_i = \sum_{j=1}^{N} f_{ij} \; P_j \quad ,$$

where

P_i = estimated number of persons in segment i,
N = number of rectangles intersected by segment i,
f_{ij} = areal fraction of rectangle j that lies within segment i, and
P_j = total number of persons assigned to rectangle j.

Input to, execution of, and output from APORT is controlled by the executive program named EXEC4. Step 5 of Appendix D illustrates the use of EXEC4 for the sample problem.

3.3.1 Input Requirements

Input to APORT is from the interactively created (by the user) data file APORT.INP and the semi-permanent data file APORT.DAT (or RD80.OUT) that was created using EXEC3. EXEC4 will ask the user to supply:

1. a 60-character, or shorter, title;
2. a two-digit integer value for the number of grid rings (maximum value = 20);
3. five-digit decimal values of the distances (in kilometers) from the origin to each ring;
4. a six-digit integer value (the first two representing degrees; the next two, minutes; and the last two, seconds) of the latitude of the origin;
5. a seven-digit integer value (the first three representing degrees; the next two, minutes; and the last two, seconds) of the longitude of the origin; and
6. the name of the output file created by EXEC3 (item 6 of Sect. 3.2.1).

3.3.2 Output

APORT produces the semi-permanent data set APORT.OUT, which is also called POP.DAT because it is called by EXEC7 to supply input needed by CONEX (Sect. 5). Although the user has no need to examine the contents of this data file, he may do so by using operations A.II.1 and A.I.4 for a file named POP. (*name of the file given in item 6 of Sect. 3.3.1*). Purging the job created by EXEC4 will not affect the data file.

SECTION 4

THE ISCLTM GROUP

4.1 INTRODUCTION

The ISCLTM group (Fig. 4.1) consists of an atmospheric dispersion program (ISCLTM); input data files MET.DAT, prepared by EXEC2 (Sect. 2.4), and ISCLTM.INP, created interactively using EXEC6 (Sect. 4.2); and the part of EXEC7 that submits ISCLTM for execution by controlling the flow of input and output data. This section describes the input data requirements of ISCLTM and how to integrate it with the other IEM programs. Steps 6 and 8 of Appendix D illustrate the use of EXEC6 and EXEC7 for the sample problem.

Since ISCLTM is essentially the same as the Industrial Source Complex, Long-Term (ISCLT) Dispersion Model, persons wishing to use IEM should be familiar with the capabilities, limitations, and input requirements of ISCLT. The only differences between ISCLTM and ISCLT arise from modifications required to accommodate two additional control switches, ISW(21) and ISW(22). The functions of these switches, which do not change the calculational capabilities of ISCLT, are explained in Appendix B, which also documents the program changes that convert ISCLT to ISCLTM.

As noted above, the user should be thoroughly familiar with input requirements of ISCLT before attempting to prepare an atmospheric dispersion (ISCLTM) run. Pages 4-58 through 4-84 of the ISCLT users' guide [1] will be helpful for this purpose. Also, the user must coordinate ISCLTM input data with that of the other IEM program groups. Coordination of the following input variables is crucial:

1. The number of grid rings specified for ISCLTM must equal the number specified in APORT (Sect. 3.3.1) and CONEX (Sect. 5.2).
2. The distances to the grid rings specified for ISCLTM must equal the distances specified in APORT (Sect. 3.3.1); distances used in CONEX are automatically set equal to those used in ISCLTM.
3. The number of individual sources specified in ISCLTM must equal the sum of the source combinations in CONEX (Sect. 5.2).

4.2 INPUT REQUIREMENTS

Input requirements for ISCLTM are identical to those for ISCLT, as described in its users' guide. [1] For use in IEM, the input data must be contained in two files -- the semi-permanent file MET.DAT that is created using EXEC2 and a permanently stored (in the user's disk library) file that may be created with or without the help of EXEC6. We recommend using EXEC6 to create input data files because the resulting file will be formatted correctly and variables that must have specific values to successfully operate IEM will automatically be given the correct values (identified

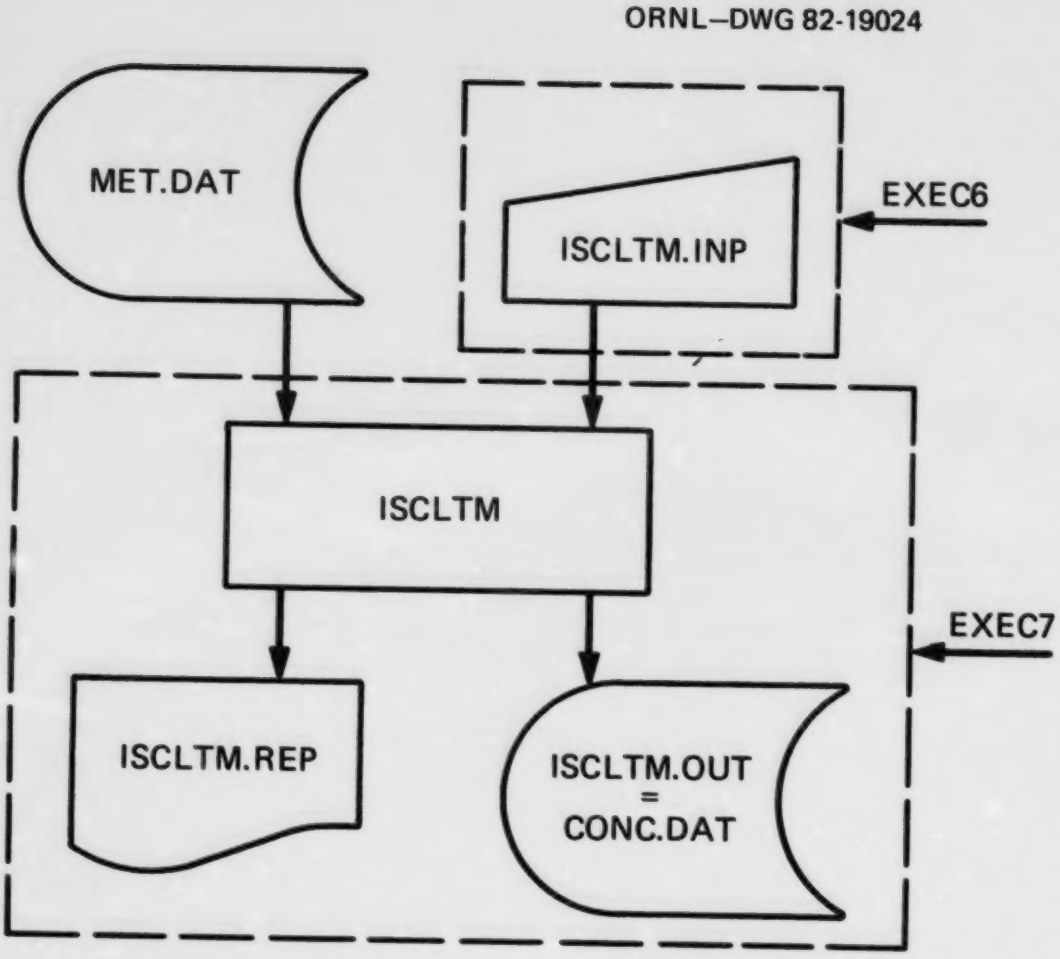

Figure 4.1. Schematic representation of input and output data flow and program control for the atmospheric dispersion program (ISCLTM).

by a star, *, in Table 4.1). A data file created using EXEC6 can be called from the user's library using operation A.II.1 (Appendix A), editted or altered using operation A.II.11 through A.II.15, and saved as a new file (A.II.2) or as a replacement file (A.II.3).

A user wishing to create a data file without the help of EXEC6 must supply values for all of the ISCLT input parameters, being careful to use the values required for the starred variables in Table 4.1, and must enter the variable values in the correct formats. Reference to the ISCLT users' guide will be necessary to determine the required formats. Such a file can be created using operation A.II.5 and saved by assigning it a name and saving it with operation A.II.2.

The remainder of this subsection discusses data entered using EXEC6 and coordination of ISCLTM and CONEX (Sect. 5) input data. To coordinate ISCLTM with the other IEM programs or to simplify interactive data input, many of the input variables have been assigned preselected values. These variables, their preselected values, and their effect on program operation are listed in Table 4.1. The remaining input variables are entered using EXEC6, which will ask the user to evaluate the following variables (starred * items are discussed after the list of variables):

1. TITLE -- an 80-character, or smaller, title;
2. ISW(4) * -- the terrain elevation switch which may be set equal to 0 for no terrain elevation data entry, or 1 for terrain elevation data entry;
3. ISW(9) -- the switch to select the mode of stability category adjustment (see pp. 2-3 through 2-5 and 4-8 of the ISCLT users' guide) which may be 0 to select the rural mode, 1 to select urban mode 1, or 2 to select urban mode 2;
4. ISW(20) -- the stack-tip downwash correction switch which may be set equal to 0 for no correction, or 1 for correction;
5. NSOURC * -- the number (four-digit integer) of individual sources to be considered;
6. NXPNTS -- the number (four-digit integer) of rings in the grid coordinate system;
7. X -- NXPNTS values (ten-digit decimal) of the distance (in meters) from the origin to each ring;
8. Z * -- (omit if ISW(4) = 0) NXPNTS × 16 values (ten-digit decimal) of the height (in feet) above mean sea level of the ground at each point of the grid coordinate system (see p. 4-26 of the ISCLT users' guide);
9. TA * -- the average annual ambient air temperature (a ten-digit decimal value in degrees Kelvin);
10. HM * -- the afternoon and morning mixing layer heights (five-digit integer values in meters);
11. DECAY * -- the time-dependent removal coefficient (decay or degradation constant) for the pollutant (a ten-digit decimal value in inverse seconds);

Items 12 through 28 must be evaluated for each of the NSOURC sources.

Table 4.1. Names, values, and functions of preselected ISCLT input variables

Variable	Value	Card group	Function
ISW(1) *	1	2	Calculate concentrations only
ISW(2) *	2	2	Polar coordinate receptor grid system
ISW(3) *	2	2	Polar discrete receptors
ISW(5) *	1	2	Output tape only
ISW(6)	3	2	Print all input data
ISW(7)	2	2	Print calculations only for one time period
ISW(8)	0	2	Print concentration from both individual and combined sources
ISW(10)	0	2	Maximum ten concentration values are not printed
ISW(11)	0	2	Not applicable
ISW(12)	0	2	Not applicable
ISW(13) *	0	2	Print output goes to logical unit 6
ISW(14)	0	2	Tape input data is read from logical unit 2
ISW(15) *	-3	2	Special output is written to mass storage using logical unit 3
ISW(16)	0	2	Each new output table starts on a new page
ISW(17)	0	2	Program prints 57 lines per page
ISW(18) *	1	2	Program reads Card Group 9
ISW(19)	0	2	Plume rise is independent of downwind distances
ISW(21) *	1	2	Program reads Card Groups 9 and 9a from logical unit 20
ISW(22) *	1	2	Program writes grid ring distances, direction vectors, and concentratins to mass storage using logical unit 3 for use in CONEX
NGROUP	0	3	Omits option to specify source combinations for print and output and precludes need for Card Groups 4 and 4a
NYPNTS *	16	3	Sets number of polar grid directions equal to 16
NXWYPT *	0	3	Sets number of arbitrarily placed receptor points = 0
NSEASN *	1	3	Sets number of seasons equal to 1 (annual)

Table 4.1. (Continued)

Variable	Value	Card group	Function
NSPEED	6	3	Sets number of wind-speed categories equal to 6
NSTBLE	6	3	Sets number of Pasquill stability categories equal to 6
NSCTOR	6	3	Sets number of wind-direction sectors equal to 16
NOFILE	0	3	Not applicable
UNITS *	Default	5	Sets output units to micrograms per cubic meter and input units to grams per second, etc.
Y *	0.0, 22.5	7	Starts grid directions at 0° and increments by 22.5° until all 16 directions are evaluated
DPDZ	6 blank or all-zero cards	12	Sets array of the vertical gradients of potential temperature to default values (p. 4-33 of ISC users' guide)
ROTATE	0.0	13	No correction made for difference in north as defined by receptor grid syste and by weather station; assumes both use common definition of north
TK	0.0	13	Sets units conversion factor to be 10^6 μg/g
ZR	10.0	13	Sets height of weather station above ground to be 10 m
BETA1	0.0	13	Sets air entrainment coefficient for an unstable atmosphere to be 0.6
BETA2	0.0	13	Sets air entrainment coefficient for a stable atmosphere to be 0.6
G	0.0	13	Sets acceleration due to gravity to be 9.8 m s^{-2}
UBAR	all 0.0	14	Sets median values of wind speed categories to be 0.75, 2.5, 4.3, 6.8, 9.5, and 12.5 m s^{-1}
THETA	2 cards of 0.0	15	Sets array of wind direction sector angles to cover 0.0° to 337.5°
P	6 cards of 0.0	16	Array of wind-speed power-law exponents (see p. 4-35 of the ISC users' guide for default values)
DISP	0	17	All sources are assumed to be new
QFLG	0	17	Assumes source emission to vary with season only

*The value assigned to this variable cannot be changed if IEM is to be run successfully.

12. NUMS -- source identification number (a five-digit integer);

13. TYPE -- source type index which is 0 for a stack, 1 for a volume, or 2 for an area;

14. DX -- the Cartesian x-coordinate (a ten-digit decimal value in meters) of the center of a stack or volume source or the southwest corner of an area source;

15. DY -- same as DX, but for the y-coordinate;

16. H -- the height (a seven-digit decimal value in meters) of the pollutant release point;

17. ZS -- the elevation (a seven-digit decimal value in meters) above mean sea level of the ground at the source location (DX, DY);

18. a seven-digit decimal value for:

    TS (if TYPE = 0) -- stack gas exit temperature (in degrees Kelvin),

    SIGYD (if TYPE = 1) -- standard deviation (in meters) of the crosswind source distribution (see p. 2-55 of the ISC users' guide), or

    XO (if TYPE = 2) -- width (in meters) of the square area source;

19. a seven-digit decimal value for:

    VEL (if TYPE = 0) -- stack gas exit velocity (in meters per second),

    SIGZO (if TYPE = 1) -- standard deviation (in meters) of the vertical source distribution (see p. 2-55 of the ISC users' guide), or

    enter 000000. (if TYPE = 2);

20. D (if TYPE = 0) -- the stack inner diameter (a seven-digit decimal value in meters), or

    enter 000000. (if TYPE = 1 or 2);

21. HB (if TYPE = 0) -- enter 0.00000 to ignore building wake effects or enter the height (a seven-digit decimal value in meters) of the building adjacent to the stack, or

    enter +00000. (if TYPE = 1 or 2);

22. BW (if TYPE = 0) -- enter 0.00000 to ignore building wake effects or enter the width (a seven-digit decimal value in meters) of the building adjacent to the stack, or

    enter +00000. (if TYPE = 1 or 2);

23. WAKE (if TYPE = 0) -- this activates the super-squat-building wake effects option, enter 0 or 1 (see pp. 4-41 and 2-31 through 2-40 of the ISC users' guide), or

    enter 2 (if TYPE = 1 or 2);

24. NVS -- the number (a two-digit integer) of particle size categories in the particle-emission size distribution (limit of 20), enter 00 to ignore particle size effects;

25. VS -- (omit if NVS = 00) the settling velocity (ten-digit decimal values in meters per second) for each particle size category;

26. FRQ -- (omit if NVS = 00) the mass fraction (ten-digit decimal values) of the total emission attributable to each particle size category (the sum of the mass fractions should equal 1);

27. GAMMA -- (omit if NVS = 00) the reflection coefficient (ten-digit decimal values) for each particle size category (each coefficient should be between 0 and 1 -- no reflection and total reflection);

28. Q -- the total pollutant emission rate from the source (E10.2 format in g s^{-1} for TYPE = 0, g m^{-3} s^{-1} for TYPE = 1, or g m^{-2} s^{-1} for TYPE = 2); and

29. a name (six characters or less) for the data file to be created and saved.

Several points should be considered when preparing input data for ISCLTM. In general, Gaussian plume dispersion models are most appropriate for flat terrains. However, as is done in ISCLTM, it is possible to estimate terrain elevation effects for stack sources by effectively adjusting the height of the plume center line (terrain elevations are ignored in volume and area source calculations). Such an adjustment usually leads to predictions of higher concentrations at elevated receptor (grid) points. Use of the terrain elevation option in ISCLTM, is controlled by ISW(4) and requires input of an elevation (in feet) above mean sea level for each receptor (grid) point (variable Z in item 8 of the above list). Site-specific terrain elevations may be obtained by plotting the grid coordinate system on a U.S. Geological Survery topographical map of the site, then reading the terrain elevations at the grid points.

A feature of ISCLT and, therefore, ISCLTM is that they calculate, in a single run, ground-level air concentrations at the grid points due to each of many individual sources. These individual sources may represent a complete source (e.g., a stack, a square area, or a cubic volume) or parts of a source (e.g., two square areas representing a rectangular source). Since NGROUP is set equal to zero, the line printer output (ISCLTM.REP, Sect. 4.4) will contain a concentration table for each individual source and a table for all individual sources combined (the sum of the contributions from each individual source). Regardless of the value of NGROUP, the temporary data file (ISCLTM.OUT, Sect. 4.4) will contain concentration values only for each individual source. These values will be ordered in the sequence in which the sources were processed. For example, consider three individual sources numbered 1 (a stack), 2 (a square area representing one half of a rectangular source), and 3(a square area representing the other half of the rectangle) and processed in the ascending order. The line printer output will contain, in order, concentration tables for source 1, source 2, source 3, and the combination of sources 1, 2, and 3. The temporary data file will contain, in order, concentration values for source 1, source 2, and source 3.

When a source is represented by more than one individual source, we are usually interested in the concentration and exposure values due to the complete source (e.g., individual sources 2 and 3 combined), not to its individual parts. IEM allows display of the values of interest through CONEX, which provides the capability to combine individual source concentrations in ISCLTM.OUT (Sect. 5.2). A vital point in linking ISCLTM and CONEX is that the number of source combinations to be considered in CONEX should equal the number of actual sources (e.g., the stack and a rectangular area source) while the number of individual sources considered in ISCLTM should equal the number of source representations (e.g., the stack and two square area sources). It is also necessary that individual sources to be combined in CONEX be processed consecutively in ISCLTM.

A limitation of ISCLT and, consequently, ISCLTM is that only pollutants having the same time-dependent removal coefficient (DECAY) can be considered in a single run. If it is desired to

run pollutants with different DECAY values, the user must prepare separate ISCLTM.INP data files for each pollutant. These files must be coordinated with separate CONEX input data files (CONEX.INP in Sect. 5.2) and run separately using EXEC7.

It is possible to consider several pollutants in one ISCLTM run, if the pollutants have the same DECAY value. If more than one pollutant is to be considered, the setup of ISCLTM.INP and CONEX.INP must be coordinated as follows:

1. For pollutants with different particle-size characteristics (VS, FRQ, and GAMMA), use a pollutant-specific problem setup. First, specify NSOURC to be the number of individual sources multiplied by the number of pollutants. Then complete items 12 through 28 NSOURC times in the following order; source 1, pollutant 1; source 2, pollutant 1; ...; source 1, pollutant 2; source 2, pollutant 2; ...; etc. Be sure to assign each source/pollutant combination a unique source identification number (NUMS). Coordination with CONEX requires processing individual sources in the correct order (see above) and specifying the correct number and order of source combinations (real sources) and pollutants in CONEX.INP (Sect. 5.2). The actual pollutant emission rate (Q) for each source/pollutant combination should be used in ISCLT.INP; emission rates of each pollutant from each source and total source emission rates need not be entered in CONEX.INP (zero values will suffice).

2. For pollutants with the same particle size characteristics, pollutant-specific problem setup can be used, but considerable setup and computer processing time can be saved by using a problem setup that is not pollutant-specific. Such a setup involves considering only one (a generic) pollutant to be emitted from each individual source used in the ISCLTM run, calculating concentrations for that pollutant, and using CONEX to calculate concentrations for all desired pollutants. Two setup options are available, depending on how the individual source emission rates are specified. The simpler option is to use unit emission rates (Q values) in ISCLTM (e.g., 1 g s^{-1} from stack, 1 g s^{-1} m^{-2} from areas, or 1 g s^{-1} m^{-3} from volumes). Coordination with CONEX requires processing the individual sources in correct order, specifying in CONEX.INP the actual number of pollutants emitted and their actual emission rates from each source combination, and specifying in CONEX.INP unit releases for each source combination (Sect. 5.2). The second option (illustrated in the sample problem) is to use the total emission rate (emission rate of pollutant 1 plus emission rate of pollutant 2, etc.) from each source for the ISCLTM run. In this case, coordination with CONEX requires processing the individual sources in correct order, specifying in CONEX.INP the number of pollutants emitted and their actual emission rates from each source combination and specifying in CONEX.INP the total emission rate for each source combination.

Input of two meteorological data variables has been simplified to reflect the type of data usually available. ISCLT requires an ambient air temperature (TA) for each stability category and a mixing layer height (HM) for each wind speed class and stability category. Since readily available, site-specific values for these variables usually include only an annual-average ambient air temperature and afternoon and morning mixing layer heights, EXEC6 accepts these values and

reformats them to meet the needs of ISCLTM. The annual-average ambient air temperature, which can be obtained from the National Oceanic and Atmospheric Administration, [3] is assumed to be the temperature for each stability category. The afternoon (HMA) and morning (HMM) mixing layer heights, which can be obtained from Holzworth, [4] are apportioned, based on EPA guidelines, [5] to the six stability categories used in IEM as follows:

Stability category	Mixing layer height
1	1.5 × HMA
2	HMA
3	HMA
4	0.5[HMA + 0.5(HMA + HMM)]
5	HMM
6	10,000 m

This apportionment is assumed to apply to each wind-speed class for each stability category.

ISCLTM is, like ISCLT, a model which is used for determining near-field impacts of air pollutant emissions. The uncertainty of ISCLTM-predicted concentrations begins to increase significantly beyond 30 km and the model is generally not applied beyond 50 km.

4.3 PROGRAM EXECUTION

Execution of ISCLTM is controlled by EXEC7, which is discussed in Sect. 6.

4.4 OUTPUT

Two types of output are generated by ISCLTM in IEM. The first type consists of line printer listings of input data, and tables of sector-averaged ground-level air concentrations ($\mu g\ m^{-3}$) due to individual and combined sources (ISCLTM.REP in Fig. 4.1). The second type consists of a temporarily stored data file containing the coordinate system and concentration data required by CONEX (ISCLTM.OUT = CONC.DAT). The latter output file is purged from the system automatically upon completion of EXEC7. The line printer listing (see the ISCLT user's guide for examples) may be examined using the following command string after the job created by EXEC7 has been executed (user responses are italicized lower-case characters):

COMMAND? *fetch abcd*

OK TO CLEAR? *ok*

COMMAND? *l 'authorization'*

LINE#1. AUTHORIZATION CODE IS 0.

LINE#2. AUTHORIZATION CODE IS 0.

COMMAND? *l line#1/end*

(listing of ISCLTM line printer output)

When the ISCLTM print output is complete, the user should type the 'BREAK' key several times. The end of output is signaled by a line containing

'...***END OF ISCLT PROGRAM, *X* SOURCES PROCESSED***...'.

Failure to break will continue printing through the CONEX job control statistics, program compilation, and output tables (see Sect 5.4).

SECTION 5

THE CONEX GROUP

5.1 INTRODUCTION

The CONEX group (Fig. 5.1) consists of a concentration-exposure program (CONEX); input data files POP.DAT, prepared by EXEC4 (Sect. 3.3), CONC.DAT, prepared by EXEC6 of the ISCLTM group (Sect. 4), and CONEX.INP, created interactively using EXEC5 (Sect. 5.2); and the part of EXEC7 that submits CONEX for execution by controlling the input data to CONEX and its line printer output (CONEX.REP). CONEX rewrites the sector-averaged ground-level air concentration estimates from ISCLTM into a variety of tables, converts the concentrations at the grid coordinates (from ISCLTM) to average concentrations over the segments (areas) defined by the centroid coordinates (Fig. 1.2), prepares tables of segment concentrations, and combines the segment concentrations and population data produced by EXEC4 to estimate and tabulate exposures (person $\mu g\ m^{-3}$) for the site of interest. Table 5.1 lists the output tables which the user may select; Appendix E contains an example of each type of table for the sample problem. Steps 7 and 8 of Appendix D illustrate the use of EXEC5 and EXEC7 for the sample problem.

CONEX accepts the annual-average, ground-level air concentrations at the grid points (GLACG) from ISCLTM (Sect. 4). Using the GLACG, CONEX calculates annual-average, ground-level air concentrations ($\mu g\ m^{-3}$) within each segment of the centroid coordinate system (GLACC) as follows: [6]

$$GLACC[s, PC(D_i, XC_j)] = \exp[C1 + (C2 - C1)\ RTEMP],$$

where, using the IEM orientation of coordinate systems (see Sect. 1 and Fig. 1.2),

s = source combination index;

$PC(D_i, XC_j)$ = the centroid coordinate located distance XC_j from the origin on direction vector D_i;

$C1$ = $\ln GLACG[s, PG(D_i, XG_j)]$;

$GLACG[s, PG(D_i, XG_j)]$ = annual-average, ground-level air concentration from source s at the grid point, PG, located distance XG_j from the origin on direction vector D_i;

$C2$ = $\ln GLACG[s, PG(D_i, XG_{j+1})]$; and

$RTEMP$ = $[\ln(XC_j/XG_j)]/[\ln(XG_{j+1}/XG_j)]$.

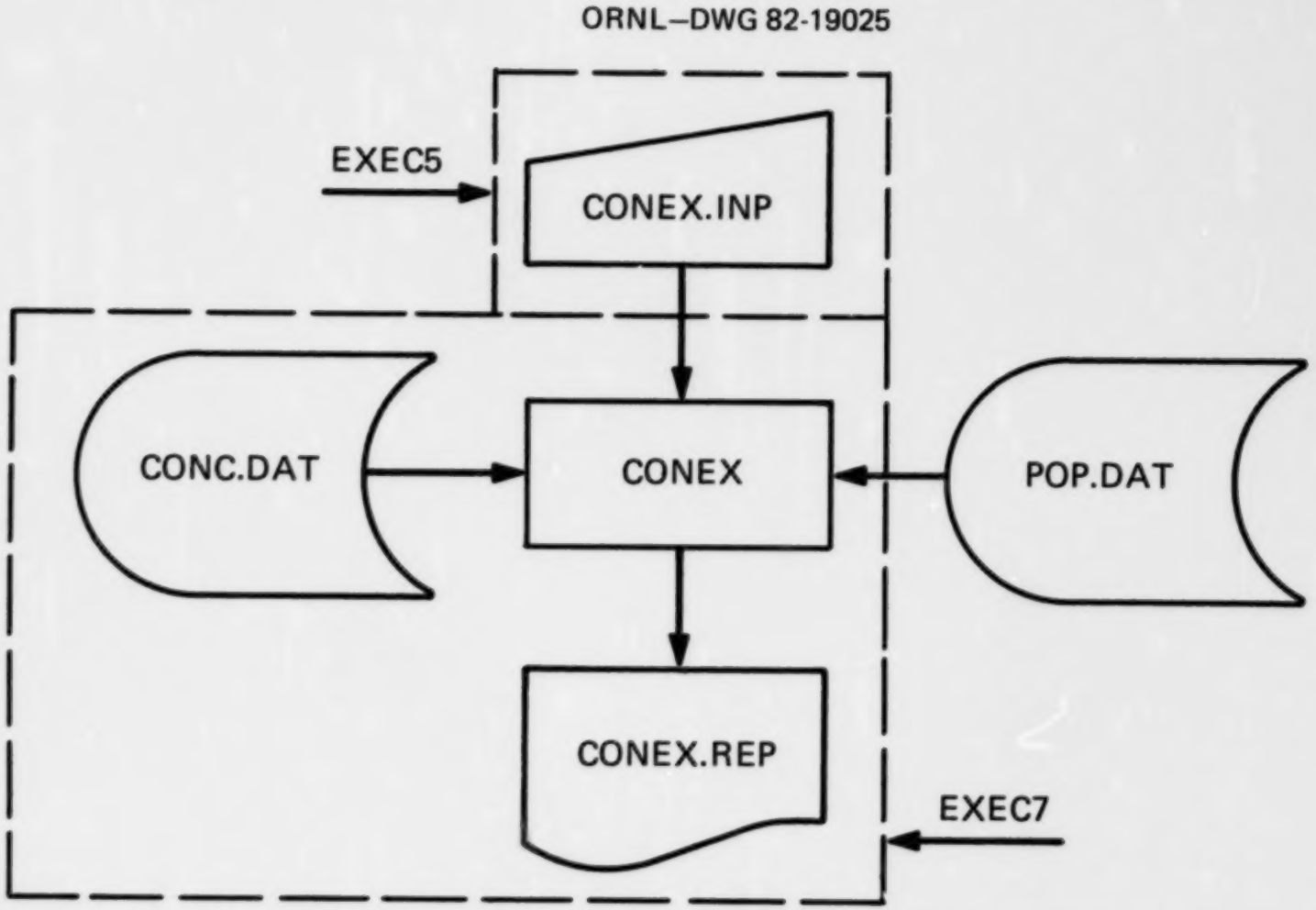

Figure 5.1. Schematic representation of input and output data flow and program control for the concentration-exposure program (CONEX).

Table 5.1. Listing of output tables produced by CONEX

1.	Number of persons in each segment of the centroid system (1 table, see Exhibit E.1).
2.	Annual-average, ground-level air concentration at each point in the grid coordinate system (GLACG) (1 table per source combination and pollutant, see Exhibit E.2).
3a.	Location and value of maximum GLACG due to each source combination (1 table per pollutant, see Exhibit E.3).
3b.	Location and value of minimum GLACG due to each source combination (1 table per pollutant, see Exhibit E.3).
4.	Relative, to maximum, value of each GLACG (1 table per source combination and pollutant, see Exhibit E.4).
5.	Ranking, in descending order, and location of each GLACG (1 table per source combination and pollutant, see Exhibit E.5).
6.	Fractional contribution of each source to each GLACG on each ring (1 table per ring and pollutant, see Exhibit E.6).
7.	Annual-average, ground-level air concentration in each segment in the centroid coordinate system (GLACC) (1 table per source combination and pollutant, see Exhibit E.7).
8a.	Location and value of maximum GLACC due to each source combination (1 table per pollutant, see Exhibit E.8).
8b.	Location and value of minimum GLACC due to each source combination (1 table per pollutant, see Exhibit E.8).
9.	Relative, to maximum, value of each GLACC (1 table per source combination and pollutant, see Exhibit E.9).
10.	Ranking, in descending order, and location of each GLACC (1 table per source combination and pollutant, see Exhibit E.10).
11.	Fractional contribution of each source to each GLACC in each radial band (1 table per band and pollutant, see Exhibit E.11).
12.	Annual-average exposures in each segment in the centroid coordinate system (EXP) (1 table per source combination and pollutant, see Exhibit E.12).
13a.	Location and value of maximum EXP due to each source combination (1 table per pollutant, see Exhibit E.13).
13b.	Location and value of minimum EXP due to each source combination (1 table per pollutant, see Exhibit E.13).

Table 5.1. (Continued)

14.	Relative, to maximum, value of each EXP (1 table per source combination and pollutant, see Exhibit E.14).
15.	Ranking, in descending order, of each EXP giving location, EXP, GLACC, GLACC rank, and number of persons for each segment (1 table per source combination and pollutant, see Exhibit E.15).
16.	Fractional contribution of each source to each EXP in each radial band (1 table for each band and pollutant, see Exhibit E.16).
17.	Summary of collective and average individual exposures due to each source combination (1 table per pollutant, see Exhibit E.17).
18.	Summary of collective and average individual exposures within each sector of the centroid coordinate system due to each source combination (1 table per pollutant, see Exhibit E.18).
19.	Summary of collective and average individual exposures within each radial band of the centroid coordinate system due to each source combination (1 table per pollutant,see Exhibit E.19).
20.	Summary of collective exposures by GLACC level (1 table per source combination per pollutant, see Exhibit E.20).

Population exposures (person $\mu g\ m^{-3}$)are calculated by multiplying the annual-average, ground-level air concentration in each segment of the centroid system by the number of persons located in that segment (e.g., the hatched area in Fig. 1.2). Population data are input as the number of persons located in each segment. If no population data are input, or the centroid cordinates assigned to the population data do not match those calculated by CONEX, population exposures are not calculated.

5.2 INPUT REQUIREMENTS

Input to CONEX comes from (1) an interactively created, permanent (in library) data file (CONEX.INP, Fig. 5.1); (2) from the previously created, semi-permanent population data file POP.DAT (from EXEC4, Sect. 3.3), and (3) from the temporary file CONC.DAT created by ISCLTM (Sect. 4) during execution of EXEC7 (Sect. 6). CONEX.INP should be prepared with the assistance of EXEC5. An existing file may edited using operations A.II.1, A.II.11 through A.II.15, and A.II.2 of Appendix A. EXEC5 asks for the following information (which is discussed below):

1. a value of 0 if the concentration values are pollutant-specific, or 1 if they are not;
2. a value of 0 if the grid system and centroid system ring distances are equal, or 1 if they are not (a value of one should be entered);
3. a value of 0 to get output tables for each source combination plus all sources combined, or 1 to get tables only for all sources combined;
4. a yes (Y) or no (N) response regarding which tables should be printed in the CONEX output -- 20 responses are required, one for each of the tables listed in Table 5.1;
5. a 40-character, or smaller, title that identifies the site and will appear in the output table headings (see Sect. 7);
6. the number (three digits) of source combinations used (no more than 20);
7. the number (three digits) of pollutants considered (no more than 25);
8. the number (three digits) of rings in the grid coordinate system, which must match the number given in Sects. 3.3.1 and 4.2;
9. an eight-character, or smaller, pollutant name (repeat this and entry 10 for each pollutant);
10. a ten-character, E-format (e.g., 1.3456E-90) value of the pollutant emission rate from source 1 (repeat for each source; omit if item 1 is set equal to zero);
11. a 12-character, or smaller, name for source 1 (repeat this and items 12 and 13 for each source);
12. the number (three digits) of individual sources from ISCLTM that make up this source combination;
13. a ten-digit, E-Format value for the total rate of emission of all pollutants from this source (omit if item 1 is set equal to zero); and
14. a six-character, or smaller, name for this permanently stored data set (be sure this name is not already contained in your directory, unless you wish to replace the old file).

In setting up this data file, care must be taken to coordinate the pollutant and source information with that used in EXEC6 for the ISCLTM run. Of principal concern is that the pollutant and source specificity of the concentration estimates be maintained (Sect. 4.2).

If item 1 is set equal to 0, the concentration values are considered to be pollutant-specific (see Sect. 4.2) and will not be altered in CONEX, except for the segment-averaging procedure. In this case, items 10 and 13 are omitted; total souce emission rates and pollutant emission rates from each source are automatically set equal to unity. If item 1 is set equal to 1, the concentration values are not considered to be pollutant specific and items 10 and 13 must be entered so that they coordinate with the option chosen for the ISCLTM run, the unit emission or total emission option (Sect. 4.2). In this mode, CONEX reads and stores the concentration values from ISCLTM. Then, for each pollutant, CONEX divides the pollutant emission rate from each source by the total emission rate from the corresponding source. These ratios are used to weight the concentration values for each source, and the weighted concentrations are processed to give source- and pollutant-specific output tables.

Remember to coordinate the order of source processing in CONEX and ISCLTM (Sect. 4.2); sources should be processed in the same order. Also, if two or more ISCLTM sources are to be combined in CONEX, the sources must be processed consecutively in ISCLTM and combined by assigning the proper number of individual sources to the CONEX source combination. It is not necessary to specify an all-source combination in CONEX; it does so automatically.

5.3 PROGRAM EXECUTION

Execution of CONEX is controlled by EXEC7, which is discussed in Sect. 6.

5.4 OUTPUT

CONEX generates only line printer output (CONEX.REP in Fig. 5.1). Any or all of the output tables described in Table 5.1 and illustrated in Appendix E can be chosen. The output tables can be listed by following the procedure given in Sect. 4.4, except the response to the last COMMAND? prompt should be *l line#2/end*.

SECTION 6

PROGRAM EXECUTION

6.1 INTRODUCTION

Final execution of ISCLTM and CONEX is controlled by EXEC7. This executive program gathers the necessary input data files, computer programs, and job control statements; executes the programs; and directs data and output flow. Step 8 of Appendix D illustrates the use of EXEC7 for the sample problem.

6.2 INPUT REQUIREMENTS

Before executing EXEC7, all of the data file created by the previously described executive programs should be available. The user should verify the existence and correctness of these data files by listing them. EXEC7 will ask for:

1. The name assigned to ISCLTM.INP in EXEC6,
2. The name assigned to MET.DAT in EXEC2,
3. The name assigned to CONEX.INP in EXEC5, and
4. The name assigned to POP.DAT in EXEC4.

6.3 OUTPUT

Output from EXEC7 has been discussed in Sects. 4.4 and 5.4.

SECTION 7

SAMPLE PROBLEM

The following sample problem is used to illustrate use of IEM. All input values were chosen arbitrarily except those requiring real values, namely, the latitude and longitude of the site (the origin); the values read from EXEC1 and EXEC2; and the name of the fine-grid data set used in EXEC3. No significance should be attached to the values used or to the results of the sample problem. All values are assumed and are used only to illustrate problem setup and execution of IEM.

A stack and a 50m × 100m rectangular area source are centered on the origin which is located at 39° 06' 48" latitude and 84° 32' 46" longitude. This location happens to be near Cincinnati, Ohio. Each source emits two pollutants that have the same characteristics. For this sample problem, we choose to model particulate pollutants to demonstrate additional input requirements. We wish to obtain estimates of the annual-average, ground-level air concentrations at the intercepts of a three-ringed polar coordinate (grid) system. We also wish to obtain estimates of the concentrations and exposures in the sector segments (centroid coordinate system) defined by the grid system. Grid ring radii were chosen to be 1.0, 5.0, and 10.0 km from the origin.

We begin (step 1) by preparing the meteorological data (joint frequency of wind speed and direction by stability category) needed for execution of ISCLTM. To use the latitude-longitude window option (OPTION=00), we subtract and add 1° from the latitude and longitude, in degrees and minutes, of the origin. This gives a window between 38° 06' (LATLO) and 40° 06' (LATHI) latitude and 83° 32' (LONLO) and 85° 32' (LONHI) longitude. These values are given to and used by EXEC0 as illustrated in step 1 of Appendix D. (To use the FIPS code option (OPTION>00), we would have found the FIPS code for Ohio (39) from Table 2.1 and would have entered this code number when EXEC0 prompted for the OPTION value. Use of the FIPS code option is not illustrated in Appendix D.)

When EXEC0 has executed, we read its output file (JOB 2839) to determine which stations may be of interest (step 2a, Appendix D). In this case, we wish to examine two stations, numbered 13840 and 93815. *After purging the file created by EXEC0, we execute EXEC1 using the station information from EXEC0. Step 2b, Appendix D, illustrates execution of EXEC1 and input of the number of stations to be examined (as 00002) and their station numbers (station numbers must be entered in ascending order).

When EXEC1 has executed, we read its output (JOB 2852), as illustrated in step 3a of Appendix D, and select the meteorological station to be used. In this example, we chose *HDR 1091 STATION 93815.** After purging the output (JOB 2852) from EXEC1, we execute EXEC2 and enter the variable values obtained from EXEC1 (step 3b, Appendix D). Variable values to be entered and (their values) are: starting record number (064229), number of records (000480), station number (93815), header number (1091), stability class (6), DN (1), monthly/seasonal/annual code (17 for annual, the only possible choice for this data set), and the file number (5). Note that the variable values were input to EXEC2 with preceding zeros to match

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* These stations are more representative of the test site than the third which lies on a plateau.

* This data set has the most extensive recording of annual average data.

the number of digits called for by the prompts. EXEC2 (step 3b, Appendix D) produces a semi-permanently stored meteorological data file named H (header number)(monthly/seasonal/annual code), H109117 in this case. This file name is needed for EXEC7 (step 8, Appendix D). The job output (JOB 2863) from EXEC2 should be purged from the system (not shown in Appendix D) because it is not needed.

Preparation of the population data file used by CONEX requires use of EXEC3 and EXEC4, as illustrated in steps 4 and 5, respectively, of Appendix D. EXEC3 prompts for the following input variables: latitude (390648) and longitude (0843246) of the origin; the value of the maximum grid ring radius in kilometers (10.); confirmation or denial of use of a fine-grid population data set (y for yes in this case); the name of the fine-grid population data set, if you choose to use one, from Table 3.1 (cinti in this case); and the name you wish to give the population data set (guide3).

After the job (2877) submitted by EXEC3 has executed, EXEC4 is executed (step 5, Appendix D). Input required for EXEC4 includes: a title for the data file (population distribution for sample problem); the number of radii or grid rings (03); the distance to each ring in kilometers (1.000, 5.000, and 10.000); the latitude (390648) and longitude (0843246) of the origin; and the name assigned in EXEC3 (step 4) to the population data file. EXEC4 produces a semi-permanently stored population data file name POP.GRID.filename (where filename = guide3 in this case). The filename is needed for EXEC7 (step 8).

Before using EXEC5 and EXEC6 to prepare the remaining input data sets for CONEX and ISCLTM, respectively, we must ensure that the data sets will be coordinated. To do this we must decide how to treat the sources and pollutants (see Sect. 4.2 and 5.2). For this example, we choose to use three individual sources, a stack and two 50-m square area sources in ISCLTM, and two source combinations in CONEX. We also choose to use the not-pollutant-specific mode for all pollutant releases from each source in both ISCLTM and CONEX (choice of the not-pollutant-specific mode is possible only if the pollutants have the same atmospheric dispersion characteristics). In CONEX, we also must insure that the actual emission rates of each pollutant from each source are employed.

The ISCLTM.INP datafile is now created (step 6 in Appendix D) using EXEC6. The title chosen for the ISCLTM run is *isc run for users guide*. We choose to enter terrain elevation data (1), use urban mode 1 stability category adjustment (1), and no stack-tip downwash correction factor (0). Our problem set up dictates using three individual sources and three grids at 1000, 5000, and 10,000 m from the origin (these distances and all succeeding values must be entered in the format called for by the prompts). The terrain elevations chosen are listed in Table 7.1 and are entered in the following order: direction 1, ring 1; direction 1, ring 2; direction 1, ring 3; direction 2, ring 1; ...; direction 16, ring 3. The annual average ambient temperature was assumed to be 285K, and the afternoon and morning mixing layer heights were assumed to be 1500 and 500 m, respectively. No pollutant decay or removal was assumed (DECAY = 0). The remaining source and pollutant data entries chosen include:

	Stack	Area 1	Area 2
Source identification number	1	2	3
Source type	0	2	2
Cartesian coordinates (x,y), m	0,0	0,-25	-50,-25
Height of release, m	30.5	10	10
Ground elevation at source, m	0	0	0
First input	400K	50m	50m
Second input	10m/s	000000.	000000.
Third input	2.5m	000000.	000000.
Fourth input	0	+00000.	+00000.
Fifth input	0	+00000.	+00000.
Sixth input	0	2	2
Number of particle-size categories	2	2	2
Settling velocity, category 1, m/s	7.5E-04	7.5E-04	7.5E-04
Settling velocity, category 2, m/s	1.2E-04	1.2E-04	1.2E-04
Fraction of total mass in category 1	0.5	0.5	0.5
Fraction of total mass in category 2	0.5	0.5	0.5
Reflection coefficient, category 1	0.5	0.5	0.5
Reflection coefficient, category 2	0.5	0.5	0.5
Value of source emission	150g s^{-1}	0.6g s^{-1} m^{2}	0.6g s^{-1} m^{2}

The final input is the name to be given to the data file created by EXEC6, namely, *guide6*. This file is saved in the user's disk library after verifying that a file with the name *guide6* does not already exist. If this name was attached to a stored file, the attempt to save it would cause the file just created to be scratched.

The settling velocities used in this example were calculated using Stokes' Law for particles having a density of 1 g m^{-3} and diameters of 5 and 2 μm. The total mass fractions and reflection coefficients have no particular meaning; they were used solely to illustrate input mechanics.

The Cartesian coordinate system used in ISCLT and, therefore, ISCLTM requires that the x-coordinate lie along direction 1, which is the North-South line in this case. Thus, the long side of the rectangular area source lies parallel to the East-West line in the sample problem setup.

We are now ready to prepare CONEX.DAT using EXEC5 (step 7, Appendix D). First, we respond 1 to indicate that we have chosen the not-pollutant-specific mode. The grid and centroid radii should never be equal; therefore, a 1 is entered next.

The user may elect to have output tables printed for each source combination and for all source combinations added together, or to have tables printed only for all source combinations added together. We chose the complete listing by entering 0. Also, since we wished to produce examples of each table listed in Table 5.1, we responded yes to the twenty prompts that ask if we wish to have a table printed.

The problem title selected was *the sample site for the users guide*. This title will appear in the table headings, as will the source and pollutant names entered below.

Our problem setup dictates that the number of source combinations be 2, the number of pollutants be 2, and the number of grid rings be 3. We now enter the name of the first pollutant, POL-

LUT 1, and its emission rate from source combination 1, 100g s^{-1}, and source combination 2, 0.1g s^{-1} m^{-1}. The second pollutant name, POLLUT 2, and its emission rate from source combination 1, 50 g s^{-1}, and source combination 2, 0.5g s^{-1} m^{-2}, are entered next. We now enter the source descriptors. Source combination 1 is named STACK SOURCE and is represented by one individual source in ISCLTM that has a total pollutant emission rate of 150g s^{-1} (the sum of its emission rates of pollutants one and two). Source combination 2 is named AREA SOURCE and is represented by two individual sources in ISCLTM that have the same total pollutant emission rate, 0.6g s^{-1} m^{-2}.

The name chosen for the data file to be created by EXEC5 is *guide5*. This file is saved in the user's disk library using the same precautions noted for saving the file created by EXEC6.

All the data files needed to run IEM are now in place and EXEC7 can be run (step 8, Appendix D). All that is required is to enter as prompted the names of the stored data files created by EXEC6 (e.g., *guide6*), EXEC2 (109117), EXEC5 (*guide5*), and EXEC4 (*guide3*). EXEC7 will execute IEM and produce a job (JOB 2696) that contains the ISCLTM and CONEX outputs. The outputs can be read by fetching the job into the active area and using the procedures given in Sections 4.4 and 5.4.

Table 7.1. Terrain elevations (ft) used in the sample problem.

Direction	Ring		
	1	2	3
1	10	30	65
2	10	35	70
3	15	40	75
4	15	45	80
5	20	50	85
6	20	55	90
7	30	60	95
8	30	65	95
9	30	60	95
10	30	55	95
11	20	50	90
12	20	45	90
13	15	40	80
14	15	35	80
15	10	30	70
16	10	25	70

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APPENDIX A

USING THE INTERACTIVE MODE (WYLBUR) OF THE IBM SYSTEM AT THE NATIONAL COMPUTER CENTER

This appendix, divided into two parts, gives sufficient information for the nonexpert user to run IEM and to create or modify files using the interactive mode (WYLBUR) of the IBM system at the National Computer Center. (For more detailed descriptions of the capabilities and operation of the system, the user should consult the appropriate manuals, which are available from the Center.) Part I explains the mechanics of executing the EXEC programs and reading output from the jobs they create and submit to the IBM system. Part II illustrates various useful procedures and commands for the interactive mode. The examples used below follow the convention used throughout this report -- computer comments are capitalized; user replies are lower case and italicized.

When in the interactive mode, the user has access to various operating and storage devices. Those of interest to the casual user are the active disk area and the following storage devices: magnetic tapes which contain all the basic meteorological and population data used by IEM; a permanent disk area which is assigned to the user and contains a library of the IEM programs, problem-specific data sets, and other files that the user may wish to keep; a job-storage disk area which is assigned to the user and contains output files from successfully executed program runs (jobs); and semi-permanent (purged periodically by the system) disk areas which may contain data files generated by some of the EXEC programs. The casual user need not be concerned with the magnetic tapes and semi-permanent disk areas.

All of the user's instructions are transmitted through the active area, which can contain only one file at a time, the active file. When the active area is ready to receive instructions, the prompt "COMMAND ?" or simply "?" will be typed on the terminal. The reply to this prompt determines which operation will be performed. All replies must end with a RETURN key stroke.

A.I EXEC PROGRAMS

Each step of IEM is controlled by an executive (EXEC) program. These programs query the user for input data, prepare an input job stream, and submit the job to the IBM system. An EXEC program (e.g., EXEC0), which must be stored as a library file in the user's permanent disk area, is run with:

COMMAND ? *execute from #exec0* or *exe fro #exec0* (A.I.1)

Before execution of the EXEC program begins, the prompt "OK TO CLEAR EXEC ?" may appear. The reply to this prompt is "ok". When the job has been submitted for execution, the following message will be typed:

JOB jobnumber jobname SUBMITTED.

The jobnumber, which is assigned by the IBM system, should be recorded because it is used to locate and retrieve the output of the job.

During execution, the EXEC programs ask for input data in specific formats (e.g., a specific number of alphanumeric characters or of digits in integer, decimal, or exponential form). Formats used in requesting numeric data and correct responses for entering the value 1 include:

Requested format	Example response
1 digit integer	1
2 digit integer	01
3 digit integer	001
4 digit integer	0001
5 digit integer	00001
6 digit integer	000001
7 digit integer	0000001
unspecified digit decimal	1.
left-adjusted digit decimal	No blanks before number
5 digit decimal	Any permutation between 1.000 and 0001.
7 digit decimal	Any permutation between 1.00000 and 000001.
10 digit decimal	Any permutation between 1.00000000 and 000000001.
E10.2	001.00E+00 (by definition) or any permutation of: 1.00000000 and 000000001., 1.0000E+00 and 00001.E+00, 10.000E-01 and 10000.E-04, 0.1000E+01 and .00001E+05, or many other permutations.

Formats used to request alphanumeric (character) data and example responses from the sample problem include:

Request	Example response
Y/N or YES OR NO	y or n.
DATA SET NAME	cinti or other name.
8 CHARACTERS	pollut 1.
TITLE, specified number of characters	Any character string containing no more than the specified number of characters.

In addition to the requests for input data, the EXEC programs ask the user several questions. The significance and responses to questions asked by one or more of the EXEC programs are as follows:

PRIORITY, 2,3, or 4 ? -- determines priority assigned to the job for execution on the IBM system; 2 calls for the default priority (lowest), 4 for the highest priority (extra charge).

DATA CORRECT (Y/N) ? -- y data file is correct, submit for execution;
n data file is incorrect, delete job (the EXEC program must be run again).

DO YOU WANT TO SAVE THE FILE TO RUN LATER Y/N ? --
y saves the file without submitting job,
n submits the job and does not save the file.

The status of a job submitted by an EXEC program is determined by:

COMMAND ? *locate* or *loc* (A.I.2)

A complete list of jobs submitted to the IBM system by the user and not deleted (purged) will be typed. If a job (e.g., jobnumber = 1234) has executed, the terminal listing will include the line:

JOB 1234 AW FETCH.

If the job has not yet executed, the listing will include:

JOB 1234 AW EXEC C=## POS=## PRI=##.

To read the contents of the output file from an executed job (e.g., jobnumber = 1234), which is stored in the job-storage disk area, it must be copied into the user's active disk area with:

COMMAND ? *fetch 1234* or *fet 1234*
OK TO CLEAR ? *ok* (See Part II for explanation of this prompt.) (A.I.3)

The complete contents of the output file for JOB 1234 can then be listed on the terminal with:

COMMAND ? *list* or *l* (A.I.4)

This listing will include system messages, any error messages, job control information, program compilation, and program output. Procedures for locating and listing only program output are given with the EXEC program descriptions and instructions in the body of the report and in Part II of this appendix.

When the contents of an output file have been read and the appropriate information has been recorded or used, the file should be deleted (purged) to conserve space in the user's job storage area. Deletion of JOB 1234 is accomplished with:

COMMAND ? *purge 1234* or *pur 1234* (A.I.5)

Although not recommended because of space limitations, the user can store the output of a job in his permanent disk library. To do this, the user should edit the output file while it is still in the active area to remove all but the desired material, then store the file. Procedures for editing and storing an active file are outlined in Part II of this appendix.

A.II INTERACTIVE OPERATIONS AND COMMANDS

In addition to the operations associated with EXEC file manipulation, several interactive operations are potentially of value to IEM users. All of the following operations require that the file to be operated on be in the user's active area. A file (e.g., FILE1) stored in the user's permanent disk library is activated (copied into the user's active area) by:

COMMAND ? *use #file1* (A.II.1)

If a file with a different name was already active (the previous file) when the above response was given, the system will prompt "OK TO CLEAR ?". Unless the previous is to be saved, the user should reply "ok" or "yes", which will irretrievably delete the previous file from the active area and activate FILE1. This response will not affect stored files. If the previous file is to be saved, the user should respond "no"; save the file using operation A.II.2 or A.II.3; then repeat operation A.II.1.

An active file can be saved (stored in the user's permanent disk library) by one of two operations. If the name to be assigned to the active file (e.g., FILE1) does not already exist in the library, use:

COMMAND ? *save #file1* or *sav #file1* (A.II.2)
MEMBER FILE1 SAVED IN CN.uid.acctuid.LIB

where uid is the user's identification code and acctuid is the accounting user identification code; these codes are assigned to the user when he opens an account. If the active file is to replace an already stored file (e.g., the active file is an edited version of a stored file), use:

COMMAND ? *save #file1 replace* or *sav #file1 rep* (A.II.3)
MEMBER FILE1 REPLACED IN CN.uid.acctuid.LIB

To delete a file (e.g., FILE1) stored in the user library area, use:

COMMAND ? *scratch #file1* or *scr #file1* (A.II.4)
MEMBER FILE1 SCRATCHED FROM CN.uid.acctuid.LIB

It is also possible to create, list, and edit files interactively. Before we demonstrate these operations, the user should know that a file contains a series of text lines. Each line begins with a decimal number that is followed by the text, a string of characters. For example, a three line file could consist of:

1. TEXT LINE 1: abc
2. TEXT LINE 2: efg
3. TEXT LINE 3: hij

This file, which we call FILE2, is created as follows (a word in parentheses indicates a key that must be depressed but is not printed):

COMMAND ? *collect file file1* or *col file file1* (A.II.5)

1. ? *text line 1: abc (RETURN)*

2. ? *text line 2: efg (RETURN)*

3. ? *text line 3: hij (RETURN)*

4. ? *(BREAK)*

The contents of an active file (e.g., FILE2) can be read (listed) completely or partially. To reproduce FILE2 as listed above in operation A.II.5, use:

COMMAND ? *list* or *l* (A.II.6)

Partial listings of the file can be obtained with the following responses to the COMMAND? prompt:

Operation	Response	
List line number #	*l #*	(A.II.7)
List all lines from line number # to line number *	*l #/**	(A.II.8)
List all lines from line number # to end of file	*l #/end*	(A.II.9)
List all lines containing a certain character string (e.g., ABCD1234)	*l 'abcd1234'*	(A.II.10)

If an existing ISCLTM or CONEX input data file requires only a few changes for use in another run or if a wrong value was entered while creating the file with an EXEC program, the user should consider editing the file, then renaming and saving it or replacing the old file. The following useful editing operations are illustrated using the file (FILE2) created above:

To change a string of characters in a line of text:

COMMAND ? *change 'text' to 'input' in 2 (RETURN)* (A.II.11)
2. INPUT LINE 2: efg

To replace specific characters in a line of text (^ means to type in a space, d deletes one character, and i allows insertion of one or more characters), the following example deletes LINE and inserts ENTRY.

COMMAND ? *modify 2 (RETURN)* (A.II.12)
2. TEXT LINE 2: efg
ALTERS ? *^^^^ddddientry(RETURN)*
2. TEXT ENTRY 2: efg

To replace an entire line (line 2):

COMMAND ? *replace 2 (RETURN)* (A.II.13)
2. *enter new line of text (RETURN)*

To insert a line of text (in this case between line 1 and line 2):

COMMAND ? *insert 1.5 (RETURN)* (A.II.14)
1.5 ? *enter line of text (RETURN)*

To delete a line of text (line 1):

COMMAND ? *delete 1 (RETURN)* (A.II.15)

Before logging off the system, changes made to the file that are desired to be kept must be saved by operations A.II.2 or A.II.3. The final operation to end an IEM session is:

COMMAND? *logoff clear (RETURN)* (A.II.16)

APPENDIX B

MODIFICATIONS THAT CONVERTED ISCLT TO ISCLTM

All modifications to ISCLT were necessitated by the addition of two control switches, ISW(21) and ISW(22). Switch ISW(21) directs the program to obtain meteorological data (input card groups 9 and 9a) either from the main input file ISCLTM.INP [ISW(21) = 0] or from a separate file MET.DAT [ISW(21) = 1]. In IEM, ISW(21) is automatically set equal to 1, and the required meteorological data are read from MET.DAT (Sect. 2.4.2). Switch ISW(22) directs the program to create a permanently stored output file. If set equal to 0, ISW(22) has no affect on documented program operation. If set equal to 1, ISW(22) directs the program to create a file containing source-specific arrays of time-average, ground-level air concentrations; the distances from the origin of the coordinate systems to each grid ring; and the values of the sixteen direction vectors. (Time refers to a month, season, or year, as specified in Sect. 2.4.1.) The latter option precludes writing tape output or complete, permanently stored output. In IEM, ISW(22) is automatically set equal to 1, and the output required as input to CONEX (ISCLTM.OUT in Sect. 4.4) is written as a temporary data file using logical unit 3.

Following are the detailed modifications made to convert ISC to ISCLTM:

1. Change all entries (six) of ISW(20) to ISW(22) in COMMON/DIM/;
2. Addition of METUNT at all endings (eight) of COMMON/REST/;
3. Change JSW(20) to JSW(22) in first DIMENSION statement;
4. Add METUNT = 20 as line 8 below "END OF INPUT DATA";
5. Below statement 10, change:

   MSOR(I), I=1,68 to MSOR(I),I=1,70

   DO 20 I=2,48 to DO 20 I=2,50;
6. Above statement 30, change DO 30 I=5,20 to DO 30 I=5,22;
7. Below statement 40, change DO 50 I=51,68 to DO 50 I=51,70;
8. Above statement 80, change DO 80 I=1,20 to DO 80 I=1,22;
9. Below statement 180, change NSOR(I), I=1,68 to NSOR(I), I=1,70;
10. Change 9006 FORMAT from 20I2 to 22I2;
11. Statement 155, change (ISW(18).NE.0) to (ISW(18).NE.0).AND.ISW(21).EQ.0), and add line

    IF(ISW(18).NE.0.AND.ISW(21).NE.0) READ (METUNT,9001) (FMT(I),I=1,2);
12. Insert above statement 160:

    IF(ISW(21).NE.0) READ (METUNT,FMT) (FREQ(I,J,M),I=1,NSPEED),

    and in statement 160, add IF(ISW(21).EQ.0) before READ;

13. Two lines above statement 240, change (ISW(4).NE.0) to (ISW(4).NE.0.AND.ISW(22).EQ.0);
14. Line above statement 240, add IF(ISW(22).EQ.0) before WRITE;
15. Four lines below statement 1350, add IF(ISW(22).EQ.0) before WRITE:
16. Two lines below statement 2240, add IF(ISW(22).EQ.0) before WRITE; and
17. Five lines below statement 2490, add IF(ISW(22).EQ.0) before WRITE.

APPENDIX C

CHECKLIST OF INPUT DATA REQUIREMENTS

The following checklist lists the input variables which must be given values to run IEM. The list is organized in steps which correspond to each EXEC program. In practice, steps 1, 2, and 3 must be done in sequence, as must steps 4 and 5. Except for step 8, which must be done last, and the above sequences, the steps may be done in any order. The ordering given here is the most logical one.

Step 1. **Execute from EXEC0:**

A. Using latitude-longitude window option:

OPTION = 00

LATLO =

LATHI =

LONLO =

LONHI =

B. Using state FIPS code option:

OPTION =

Step 2. **Read output from Step 1 and execute from EXEC1:**

Number of stations to be examined =

Station number of first station =

Station number of second station =

Step 3. **Read output from Step 2, select a station, and execute from EXEC2:**

NSTART =

NREC =

STATION NUMBER =

HDR =

STAB CLASS =

PER =

M/S/A CODE =

FILE NUMBER =

This step creates the meteorological data set for use in EXEC7 (Step 8) by ISCLTM. In this case, the data-set-name extension is H + HDR + PER.

Step 4. **Execute from EXEC3:**

Latitude of origin =

Longitude of origin =

Maximum radius (km) =

Is there a fine-grid data set =

Name of fine-grid data set = *(omit if no fine-grid data set)*

Name you wish to call population data set =

Step 5. **After job submitted by EXEC3 has run, execute from EXEC4:**

Title =

Number of grid rings =

Distance (km) to grid ring 1 =

Distance (km) to grid ring 2 =

Distance (km) to grid ring 3 =

Latitude of origin =

Longitude of origin =

Name you wish to call population data set =

Step 6. **Execute from EXEC6:**

Problem title =

Terrain elevation index =

Mode =

Stack-tip downwash correction =

Number of input sources (cards) =

Number of grid coordinate rings =

Distances (m) from origin to ring 1 =

Distances (m) from origin to ring 2 =

Distances (m) from origin to ring 3 =

Terrain elevations (ft) if used = *(number of values to be entered = number of rings × 16)*

Annual-average ambient air temperature (K) =

Afternoon mixing layer height (m) =

Morning mixing layer height (m) =

Decay or degradation constant (s^{-1}) =

For each source, enter:

Source identification number =

Source type code =

Cartesian coordinates of source location (in meters from the origin): give center of stack or volume source, or southwest corner of area source:

x-coordinate =

y-coordinate =

Height (m) above ground of source release point =

Elevation (m) above sea level of ground at source location =

Stack gas exit temperature (K) for a stack, standard deviation of the crosswind source distribution (m) for a volume or width of an area (m) =

Stack gas exit velocity (m/s) for a stack, standard deviation of the vertical source distribution (m) for a volume, or 000000. for an area =

Inner stack diameter (m) for a stack or 000000. for a volume or area =

Height (m) above ground of building adjacent to stack =

Width (m) of building adjacent to stack =

Super squat building wake effect option =

Number of particulate size categories =

If number of particle size categories is greater than zero, enter for each category:

Settling velocity ($m\ s^{-1}$) =

Fraction total mass of particles in size category =

Surface reflection coefficient =

Value of source emission (g/s for stack, $g\ m^{-2}s^{-1}$ for area, or $g\ m^{-3}s^{-1}$ for volume) =

Name to be given to this data file =

Step 7. **Execute from EXEC5:**

Are concentration data pollutant specific? =

Are grid and centroid radii equal? =

Table selection index for each source plus all combined or only all combined =

Output table selection (20 prompts) =

Title =

Number of source combinations =

Number of pollutants =

Number of grid rings =

For each pollutant, enter:

Name of pollutant =

Emission rate of pollutant from each source ($g\ s^{-1}$ for stack, $g\ m^{-2}s^{-1}$ for area, or $g\ m^{-3}s^{-1}$ for volume) =

For each source combination, enter:

Name of source combination =

Number of individual sources that make up combination =

Total emission rate (units as above) from source combination =

Name to be given to this file =

Step 8. **Execute from EXEC7:**

Name of ISCLTM data set (from Step 6) =

Name of four-digit header plus

PER value used in EXEC2 (Step 3) =

Name of CONEX data set (Step 7) =

Name of population data set (Step 5) =

APPENDIX D

LISTING OF EXEC PROGRAM SESSIONS FOR THE SAMPLE PROBLEM

This appendix contains a record of the IEM session used to run the sample problem. Values supplied by the user are printed in lower-case characters and are underlined. The IEM session is divided into steps. Each step includes the operations needed to run one of the eight EXEC programs.

Step 1:

```
? exe fro $exec0
OK TO CLEAR EXEC? ok
ENTER A 2 DIGIT INTEGER TO SELECT SEARCH MODE:
00 FOR LATLON SEARCH, FIPS CODE NUMBER FOR STATE SEARCH.
ENTER (2 DIGIT INTEGER) ? 00
ENTER LOWER & UPPER BOUNDS OF LAT WINDOW IN DDMM AS PROMPTED
WHERE DD IS DEGREES AND MM IS MINUTES
ENTER LATLO (4 DIGIT INTEGER) ? 3806
ENTER LATHI (4 DIGIT INTEGER) ? 4006
ENTER LOWER & UPPER BOUNDS OF LON WINDOW IN DDDMM AS PROMPTED
ENTER LONLO (5 DIGIT INTEGER) ? 08332
ENTER LONHI (5 DIGIT INTEGER) ? 08532
LIST OF DATA YOU HAVE PUT IN
   72.     00
   73.     38064006 0833208532
   74.     //GO.FT10F001 DD DSN=CN.EPATOE.AEHW.SERCH.DAT,
   75.     // DISP=SHR
   76.     /*
   77.     //
ARE THESE DATA CORRECT? ENTER Y OR N,
IF 'Y', JOB IS SUBMITTED TO IBM SYSTEM;
IF 'N', EXEC0 IS CANCELLED AND NO JOB IS SUBMITTED.
ENTER (Y OR N) ? y
ENTER PRIORITY: 2, 3, OR 4 ? 4
JOB 2839 EPATOESR SUBMITTED
?
```

Step 2a:

```
? fetch 2839
OK TO CLEAR? ok
? l 'printout'
  242.          ISN 0013      3000 FORMAT(' ***PRINTOUT BEGINS HERE ***')
  578.      ***PRINTOUT BEGINS HERE ***
? l 579/end
  579.      LAT 3806 TO 4006
  580.      LON  8332 TO  8532
  581.      STATION 13840  DAYTON/PATTERSON OH LAT 3952 LON  8407 FIPS ST39
  582.      STATION 93814  COVINGTON/GTR CINKY LAT 3904 LON  8440 FIPS ST21
  583.      STATION 93815  DAYTON/JM COX DAYOH LAT 3945 LON  8413 FIPS ST39
  584.      NUMBER OF STATIONS FOUND    3


? purge 2839
```

Step 2b:

```
? exe frq $execl
USING RESULTS OF EXECO, ENTER NUMBER OF STATIONS
YOU WISH TO EXAMINE (5 DIGIT INTEGER) ? 00002
NUMBER OF STATION $
1
ENTER? 13840
NUMBER OF STATION $
2
ENTER? 93815
LIST OF DATA YOU HAVE PUT IN
   44.     //GO.FT05F001 DD *
   45.     00002
   46.     13840
   47.     93815
   48.     //FT10F001 DD DSN=CN.EPATOE.AEHW.DIREC.DAT,
   49.     // DISP=SHR
   50.     /*
   51.     //
ARE THESE DATA CORRECT (Y/N) ? y
ENTER PRIORITY: 2, 3 OR 4 ? 4
JOB 2852 EPATOEDR SUBMITTED
?
```

Step 3a:

```
? fetch 2852
OK TO CLEAR? ok
? l 'printout'
  237.          ISN 0005      3000 FORMAT(' *****PRINTOUT BEGINS HERE******')
  401.      *****PRINTOUT BEGINS HERE******
? l 402/end
  402.      NUMBER OF STATIONS     2
  403.      13840 93815
  404.      0******
  405.      0 HDR 1015 STATION 13840
  406.        DAYTON/PATTERSON  OH YRS 6401-6412
  407.      PER  / /A STAB CLASS 8 DAYNITE (BLANK IF NOT) DN
  408.      NSTART   15853 NREC   128 FILE NUMBER  5
  409.      0******
  410.      0 HDR  688 STATION 93815
  411.        DAYTON/JM COX DAY OH YRS 7301-7312
  412.      PER  / /A STAB CLASS 6 DAYNITE (BLANK IF NOT)
  413.      NSTART   88439 NREC    96 FILE NUMBER  4
  414.      0******
  415.      0 HDR  405 STATION 93815
  416.        DAYTON/JM COX DAY OH YRS 6901-6912
  417.      PER  /S/A STAB CLASS 5 DAYNITE (BLANK IF NOT)
  418.      NSTART   88039 NREC   400 FILE NUMBER  4
```

```
0*******
0 HDR  812 STATION 93815
   DAYTON/JM COX DAY OH YRS 7301-7312
 PER  / /A STAB CLASS 7 DAYNITE (BLANK IF NOT) DN
 NSTART   88535 NREC   112 FILE NUMBER  4
0*******
0 HDR  404 STATION 93815
   DAYTON/JM COX DAY OH YRS 6501-6912
 PER  /S/A STAB CLASS 5 DAYNITE (BLANK IF NOT)
 NSTART   87639 NREC   400 FILE NUMBER  4
0*******
0 HDR 1228 STATION 93815
   DAYTON/JM COX DAY OH YRS 7501-7512
 PER  /S/A STAB CLASS 6 DAYNITE (BLANK IF NOT) DN
 NSTART  130150 NREC   480 FILE NUMBER  6
0*******
0 HDR 1360 STATION 93815
   DAYTON/JM COX DAY OH YRS 6401-6412
 PER  / /A STAB CLASS 6 DAYNITE (BLANK IF NOT) DN
 NSTART  130630 NREC    96 FILE NUMBER  6
0*******
0 HDR 1065 STATION 93815
   DAYTON/JM COX DAY OH YRS 7301-7312
 PER  /S/A STAB CLASS 6 DAYNITE (BLANK IF NOT)
 NSTART   63819 NREC   480 FILE NUMBER  5
0*******
0 HDR 1091 STATION 93815
   DAYTON/JM COX DAY OH YRS 7001-7412
 PER  /S/A STAB CLASS 6 DAYNITE (BLANK IF NOT) DN
 NSTART   64299 NREC   480 FILE NUMBER  5
0*******
0 HDR  813 STATION 93815
   DAYTON/JM COX DAY OH YRS 6901-7312
 PER  / /A STAB CLASS 7 DAYNITE (BLANK IF NOT) DN
 NSTART   88647 NREC   112 FILE NUMBER  4
0*******
0 HDR 1130 STATION 93815
   DAYTON/JM COX DAY OH YRS 7401-7412
 PER  /S/A STAB CLASS 6 DAYNITE (BLANK IF NOT) DN
 NSTART  129670 NREC   480 FILE NUMBER  6
0*******
0 HDR  924 STATION 93815
   DAYTON/JM COX DAY OH YRS 7401-7412
 PER  / /A STAB CLASS 6 DAYNITE (BLANK IF NOT)
 NSTART   88759 NREC    96 FILE NUMBER  4
```

purge 2852

Step 3b:

```
? exe fro $exec2
READ IN INFORMATION TO GET DATA FROM STAR TAPE.
THIS PROGRAM SHOULD BE RUN AFTER EXEC0 AND EXEC1.
ENTER STARTING RECORD NUMBER (6 DIGIT INTEGER) ? 064299
ENTER NUMBER OF RECORDS (6 DIGIT INTEGER) ? 000480
ENTER STATION NUMBER (5 DIGIT INTEGER) ? 93815
ENTER HEADER (4 DIGIT INTEGER) ? 1091
REMEMBER THIS HEADER NUMBER TO USE IN EXEC7.
THIS NUMBER, PRECEDED BY AN 'H' AND FOLLOWED BY THE TIME CODE,
WILL BE THE MET DATA SET NAME EXTENSION YOU HAVE CREATED.
ENTER STABILITY CLASS: 5, 6, 7, OR 8.
ENTER STABILITY CLASS (1 DIGIT INTEGER) ? 6
ENTER 1 IF 'DN' IS INDICATED, 0 OTHERWISE ? 1
ENTER TIME CODE BASED ON THE 'PER' VALUE:
01-12 FOR A MONTH (JAN-DEC),
13-16 FOR A SEASON (WINTER-FALL), 17 FOR ANNUAL.
ENTER TIME CODE (2 DIGIT INTEGER) ? 17
ENTER FILE NUMBER, (1 DIGIT INTEGER, 1-6) ? 5
LIST OF DATA YOU HAVE PUT IN
   99.     //GO.FT05F001 DD *
  100.     064299000480 93815  1091 6 1 17 5
  101.     //GO.FT10F001 DD DSN=CN.EPAGHH.AEHW.STAR05,DISP=SHR
  102.     //GO.FT20F001 DD DSN=CN.EPATOE.AEHW.H109117,
  103.     // UNIT=SYSDA,DCB=(RECFM=FB,LRECL=80,BLKSIZE=8000),
  104.     // SPACE=(TRK,(50,10),RLSE),DISP=(NEW,CATLG,DELETE)
  105.     /*
  106.     //
ARE THESE DATA CORRECT (Y/N) ? y
ENTER PRIORITY: 2,3 OR 4 ? 4
JOB 2863 EPATOERD SUBMITTED
YOU HAVE CREATED A MET DATA SET WITH THE EXTENSION:
'H109117'
?
```

```
? fetch 2863
OK TO CLEAR? ok
? l 'printout'
  251.        ISN 0007      3000 FORMAT(' *****PRINTOUT BEGINS HERE *****')
  517.      *****PRINTOUT BEGINS HERE *****
? l 518/end
  518.      NSTART  64299 NREC    480 STN  93815 HDR   1091 STAB 6 DN 1 MSA 17
  519.      1091 17
  520.        1 1 0.000270.000210.0    0.0    0.0    0.0
  521.        2 1 0.000100.0    0.0    0.0    0.0    0.0
  522.        3 1 0.000150.000140.0    0.0    0.0    0.0
  523.        4 1 0.000120.000070.0    0.0    0.0    0.0
  524.        5 1 0.000420.000340.0    0.0    0.0    0.0
  525.        6 1 0.000110.000270.0    0.0    0.0    0.0
  526.        7 1 0.0    0.0    0.0    0.0    0.0    0.0
  527.        8 1 0.000250.000140.0    0.0    0.0    0.0
  528.        9 1 0.000270.000210.0    0.0    0.0    0.0
  529.       10 1 0.000080.000210.0    0.0    0.0    0.0
  530.       11 1 0.000110.000270.0    0.0    0.0    0.0
  531.       12 1 0.000180.000210.0    0.0    0.0    0.0
  532.       13 1 0.000110.000270.0    0.0    0.0    0.0
  533.       14 1 0.000340.000140.0    0.0    0.0    0.0
  534.       15 1 0.000150.000140.0    0.0    0.0    0.0
  535.       16 1 0.000150.000140.0    0.0    0.0    0.0
  536.        1 2 0.000720.001440.001160.0    0.0    0.0
  537.        2 2 0.000350.001160.000480.0    0.0    0.0
  538.        3 2 0.000240.000550.000750.0    0.0    0.0
  539.        4 2 0.000560.001160.000890.0    0.0    0.0
  540.        5 2 0.000730.001510.000620.0    0.0    0.0
  541.        6 2 0.000500.001370.000750.0    0.0    0.0
  542.        7 2 0.000490.001160.000620.0    0.0    0.0
  543.        8 2 0.000720.001300.000340.0    0.0    0.0
  544.        9 2 0.000520.001780.001510.0    0.0    0.0
  545.       10 2 0.000210.001230.001300.0    0.0    0.0
  546.       11 2 0.000870.001580.000890.0    0.0    0.0
  547.       12 2 0.000970.002060.001160.0    0.0    0.0
  548.       13 2 0.001000.002600.001230.0    0.0    0.0
  549.       14 2 0.000410.000890.001230.0    0.0    0.0
  550.       15 2 0.000690.000820.000820.0    0.0    0.0
  551.       16 2 0.000330.000890.000550.0    0.0    0.0
  552.        1 3 0.000740.001850.003080.000550.0    0.0
  553.        2 3 0.000510.000820.001370.000340.0    0.0
  554.        3 3 0.000280.000690.001990.000410.0    0.0
  555.        4 3 0.000300.000960.002740.000480.0    0.0
  556.        5 3 0.000360.001710.003630.000070.0    0.0
  557.        6 3 0.000580.001640.002400.000480.0    0.0
  558.        7 3 0.000380.001990.002670.000210.0    0.0
  559.        8 3 0.000210.001710.002600.000210.0    0.0
  560.        9 3 0.000490.001510.005890.000750.0    0.0
  561.       10 3 0.000200.001580.005480.001030.000070.0
  562.       11 3 0.000460.001160.006030.000890.000210.0
  563.       12 3 0.000750.001990.003840.001440.000140.00007
```

```
564.      13 3 0.000590.001850.005410.001030.000070.0
565.      14 3 0.000390.001160.003080.000550.000070.0
566.      15 3 0.000100.001300.002530.000340.0    0.0
567.      16 3 0.000290.000890.001990.000550.0    0.0
568.       1 4 0.000130.003490.005410.006230.000550.00007
569.       2 4 0.000100.001850.003630.002880.000340.00014
570.       3 4 0.000110.002470.003220.002400.000550.00007
571.       4 4 0.000380.001640.002400.002600.0    0.0
572.       5 4 0.000180.002400.005760.003910.000410.00007
573.       6 4 0.000190.002670.004450.003840.000550.0
574.       7 4 0.000200.003150.005890.003290.000340.0
575.       8 4 0.000040.002400.004250.004380.000550.00007
576.       9 4 0.000280.003770.013570.015830.003700.00034
577.      10 4 0.000330.002950.008980.016510.003290.00048
578.      11 4 0.000140.003970.006850.011650.003080.00048
579.      12 4 0.000260.003010.006030.012740.003560.00096
580.      13 4 0.000270.003630.008980.017950.004450.00089
581.      14 4 0.000040.002190.005340.008840.001580.00014
582.      15 4 0.000250.002120.005280.006300.000620.00014
583.      16 4 0.000050.002670.003910.004110.001030.00027
584.       1 5 0.001130.003700.006170.005410.001370.00027
585.       2 5 0.000720.003080.005070.002060.000270.0
586.       3 5 0.000520.002190.004860.002880.000210.0
587.       4 5 0.000270.001780.005210.002470.000070.0
588.       5 5 0.000430.001920.008630.005000.000210.0
589.       6 5 0.000410.002810.008430.003700.000270.0
590.       7 5 0.000650.001990.010410.003630.000140.0
591.       8 5 0.000260.001710.007190.002470.000750.0
592.       9 5 0.000650.003080.017400.019530.002190.00014
593.      10 5 0.000340.001780.012130.012610.001780.00027
594.      11 5 0.000510.002060.006580.007130.001370.00021
595.      12 5 0.000730.002120.006580.006780.001780.00034
596.      13 5 0.000690.005820.009660.014870.002810.00144
597.      14 5 0.000510.002120.006370.009930.001580.00014
598.      15 5 0.000280.001990.004930.005210.000550.00021
599.      16 5 0.000650.001990.005280.004800.000890.0
600.       1 6 0.003900.008910.003010.0    0.0    0.0
601.       2 6 0.002640.005550.001850.0    0.0    0.0
602.       3 6 0.001340.006170.002670.0    0.0    0.0
603.       4 6 0.002330.006230.001920.0    0.0    0.0
604.       5 6 0.002750.008700.004800.0    0.0    0.0
605.       6 6 0.002470.008220.002600.0    0.0    0.0
606.       7 6 0.002820.013700.004320.0    0.0    0.0
607.       8 6 0.002670.008700.003010.0    0.0    0.0
608.       9 6 0.003910.017470.011300.0    0.0    0.0
609.      10 6 0.002240.009660.008980.0    0.0    0.0
610.      11 6 0.002620.010350.005070.0    0.0    0.0
611.      12 6 0.002440.009390.004450.0    0.0    0.0
612.      13 6 0.004210.012470.006030.0    0.0    0.0
613.      14 6 0.001300.006510.004590.0    0.0    0.0
614.      15 6 0.002140.005820.004660.0    0.0    0.0
615.      16 6 0.002230.007400.003700.0    0.0    0.0
```

Step 4:

```
? exe fro $exec3
THIS PROGRAM READS THE POPULATION WITHIN A GIVEN RADIUS
(IN KILOMETERS) AROUND THE SITE AND SAVES THE DATA SET
ON LINE FOR EXEC4. CHECK USER GUIDE TO SEE IF THERE
IS A FINE GRID DATA SET. IF SO, NOTE THE DATA SET NAME
CAREFULLY.  NOTE: IF A PROMPT IS REPEATED,
YOU HAVE MADE A MISTAKE.  REPEAT THE ENTRY.
ENTER LATITUDE OF SITE IN DDMMSS, WHERE
DD IS DEGREES, MM IS MINUTES, AND SS IS SECONDS.
ENTER LATITUDE, (6 DIGIT INTEGER) ? 390648
ENTER LONGITUDE OF SITE IN DDDMMSS.
ENTER LONGITUDE, (7 DIGIT INTEGER) ? 0843246
ENTER MAXIMUM RADIUS, IN KM (INCLUDE DECIMAL PT.)? 10.
IS THERE A FINE GRID DATA SET YOU WANT TO USE?
ENTER (Y/N) ? y
ENTER NAME OF FINE GRID DATA SET ? cinti
ENTER NAME FOR YOUR POPULATION DATA SET ? guide3
LISTING OF DATA YOU HAVE PUT IN.
  113.     //GO.FT05F001 DD *
  114.     390648 0843246 1
  115.     10.
  116.     //GO.FT10F001 DD DSN=CN.EPAGHH.AEHW.POPGRID.CINTI,DISP=SHR
  117:     //GO.FT01F001 DD DSN=CN.EPAGHH.AEHW.POPGRID.TENTHDEG,DISP=SHR
  118.     //GO.FT20F001 DD DSN=CN.EPATOE.AEHW.POP.GRID.GUIDE3,
  119.     // UNIT=SYSDA,DCB=(RECFM=FB,LRECL=80,BLKSIZE=8000),
  120.     // SPACE=(TRK,(150,10),RLSE),DISP=(NEW,CATLG,DELETE)
  121.     /*
  122.     //
ARE THESE DATA CORRECT (Y/N) ? y
ENTER PRIORITY: 2, 3 OR 4 ? 4
JOB 2877 EPATOEP SUBMITTED
DO YOU WANT TO SAVE THE FILE TO RUN LATER (Y/N) ?
ENTER (Y/N) ? y
MEMBER GUIDE3 REPLACED IN LIB
?

? fetch 2877
OK TO CLEAR? ok
? l 'code'
   98.     IEF142I EPATOEP FORT - STEP WAS EXECUTED - COND CODE 0000
  138.     IEF142I EPATOEP LKED - STEP WAS EXECUTED - COND CODE 0000
  180.     IEF142I EPATOEP GO - STEP WAS EXECUTED - COND CODE 0000
  548.     AUTHORIZATION CODE IS          0.
? l 549/end
  549.
  550.     MAX RADIUS (KM)    10.0000 GRID SIZE     0.1000
  551.     LAT 39. 6.48.=   39.1133 LON  84.32.46.=   84.5461
  552.     WDTH 0.8622E+01 HT 0.1111E+02
  553.     LATITUDE WINDOW   38.91331   39.31329  LONGITUDE WINDOW 84.28833 84.80385
  554.           33        27       891
  555.     LATMN 0.3862E+02 LATMX 0.3948E+02 LONMN 0.8392E+02 LONMX 0.8498E+02
  556.     NUMBER OF CELLS      891
?
```

Step 5:

```
? exe fro $exec4
ENTER A 60 CHARACTER OR SMALLER TITLE.
ENTER? population distribution for sample problem
ENTER THE NUMBER OF RADII CHOSEN,
1 TO 20 RADII ALLOWED.
ENTER NUMBER OF RADII (2 DIGIT INTEGER) ? 03
ENTER THE DISTANCE (IN KILOMETERS) TO EACH RADIUS,
ONE AT A TIME, INCLUDING THE DECIMAL POINT.
ENTER DISTANCE TO RADIUS NUMBER
1
DISTANCE (5 DIGIT DECIMAL) ? 1.000
ENTER DISTANCE TO RADIUS NUMBER
2
DISTANCE (5 DIGIT DECIMAL) ? 5.000
ENTER DISTANCE TO RADIUS NUMBER
3
DISTANCE (5 DIGIT DECIMAL) ? 10.00
ENTER LATITUDE OF SITE IN DDMMSS.
LATITUDE (6 DIGIT INTEGER) ? 390648
ENTER LONGITUDE OF SITE IN DDDMMSS.
LONGITUDE (7 DIGIT INTEGER) ? 0843246
ENTER NAME GIVEN TO DATA SET CREATED BY EXEC3 ? guide3
REMEMBER THIS DATA SET NAME FOR USE IN EXEC7
'GUIDE3'
LISTING OF DATA YOU HAVE PUT IN.
  965.     //GO.FT05F001 DD *
  966.     POPULATION DISTRIBUTION FOR SAMPLE PROBLEM
  967.      03
  968.     1.000
  969.     5.000
  970.     10.00
  971.     390648 0843246
  972.     //GO.FT01F001 DD DSN=CN.EPATOE.AEHW.POP.GRID.GUIDE3,DISP=SHR
  973.     //GO.FT20F001 DD DSN=CN.EPATOE.AEHW.POP.GUIDE3,
  974.     // UNIT=SYSDA,DCB=(RECFM=FB,LRECL=80,BLKSIZE=8000),
  975.     // SPACE=(TRK,(50,10),RLSE),DISP=(NEW,CATLG,DELETE)
  976.     /*
  977.     //
ARE THESE DATA CORRECT (Y/N) ?
ENTER? y
ENTER PRIORITY: 2, 3 OR 4.
ENTER PRIORITY (1 DIGIT INTEGER) ? 4
JOB 2892 EPATOEAP SUBMITTED
DO YOU WANT TO SAVE THE FILE TO RUN LATER (Y/N) ?
ENTER? y
MEMBER GUIDE3 REPLACED IN LIB
?
```

```
? fetch 2892
OK TO CLEAR? ok
? 1 'printout'
  258.          ISN 0015      3000 FORMAT(' *****PRINTOUT BEGINS HERE')
 2583.       *****PRINTOUT BEGINS HERE
? 1 2584/end
 2584.       POPULATION DISTRIBUTION FOR SAMPLE PROBLEM
 2585.         3
 2586.        1.00  5.00 10.00
 2587.       MAX RADIUS (KM)    10.0000 GRID SIZE     0.1000
 2588.       LAT 39. 6.48.=   39.1133 LON  84.32.46.=   84.5461
 2589.       WDTH 0.8622E+01 HT 0.1111E+02
 2590.       LATITUDE WINDOW   38.91331   39.31329  LONGITUDE WINDOW 84.28833 84.80385
 2591.       NUMBER OF FINE GRID CELLS        891
 2592.       NUMBER OF CELLS        891
 2593.       NPOLY        891
 2594.        SUMMARY OF EXTENSIVE VARIABLE; CELL RADIUS(COLUMN) BY CELL SECTOR (ROW)
 2595.       POPULATION DISTRIBUTION FOR SAMPLE PROBLEM
 2596.         2 16
 2597.          3000.00   7500.00
 2598.          0.0      22.50     45.00     67.50     90.00  112.50  135.00  157.50
 2599.       180.00    202.50    225.00    247.50    270.00  292.50  315.00  337.50
 2600.       SECTOR NUMBER   1
 2601.               0.     3737.    16748.
 2602.       SECTOR NUMBER   2
 2603.               0.    14834.    22205.
 2604.       SECTOR NUMBER   3
 2605.               0.     7117.    34388.
 2606.       SECTOR NUMBER   4
 2607.               0.     2637.    43606.
 2608.       SECTOR NUMBER   5
 2609.               0.    33710.    28942.
 2610.       SECTOR NUMBER   6
 2611.               0.    26922.    10389.
 2612.       SECTOR NUMBER   7
 2613.               0.     7518.    20023.
 2614.       SECTOR NUMBER   8
 2615.               0.    18566.    24214.
 2616.       SECTOR NUMBER   9
 2617.               0.     6418.    14908.
 2618.       SECTOR NUMBER  10
 2619.             468.    14178.    12221.
 2620.       SECTOR NUMBER  11
 2621.            1437.     6960.    21363.
 2622.       SECTOR NUMBER  12
 2623.            1633.    14704.     9146.
 2624.       SECTOR NUMBER  13
 2625.            1672.    19509.    17974.
 2626.       SECTOR NUMBER  14
 2627.            1301.     2984.    18519.
 2628.       SECTOR NUMBER  15
 2629.             157.     5955.    18937.
```

```
2630.      SECTOR NUMBER  16
2631.              0.    14162.    16932.
2632.      RADIUS        1.00 TOTAL 0.6668E+04
2633.      RADIUS        5.00 TOTAL 0.1999E+06
2634.      RADIUS       10.00 TOTAL 0.3305E+06
2635.      N     20485. NNE     37038. NE     41505. ENE     46243.
2636.      E     62652. ESE     37311. SE     27540. SSE     42779.
2637.      S     21326. SSW     26867. SW     29760. WSW     25483.
2638.      W     39155. WNW     22803. NW     25048. NNW     31095.
2639.      TOTAL TO MAX. RADIUS 0.5371E+06
2640.       END APORT EXECUTION
?
```

Step 6:

```
? exe fro $execó
OK TO CLEAR EXEC? ok
ENTER TITLE OF PROBLEM (80 CHARACTERS OR LESS):
TITLE ? isc run for users guide
THE FOLLOWING ARE PROMPTS FOR SELECTING THE VARIOUS OPTIONS
WHICH ARE AVAILABLE.  SELECT DESIRED OPTIONS.
**************************************
ENTER 1 TO INPUT TERRAIN ELEVATION DATA, 0 OTHERWISE:
ENTER (1 DIGIT INTEGER) ? 1

ENTER 0 FOR RURAL MODE, 1 FOR URBAN MODE-1, OR 2 FOR URBAN
MODE-2 DISPERSION CONDITIONS.  SEE ISC USER'S GUIDE FOR
DESCRIPTION OF MODES.
ENTER (1 DIGIT INTEGER) ? 1

ENTER 0 FOR NO STACK-TIP DOWNWASH CORRECTION MADE AT
   THE STACK HEIGHT,
OR 1 FOR THE BRIGGS (1973) DOWNWASH CORRECTION
   APPLIED TO THE STACK HEIGHT.
ENTER (1 DIGIT INTEGER) ? 0

ENTER THE NUMBER OF INDIVIDUAL SOURCES TO BE
READ.  IF A NEGATIVE NUMBER, THE PROGRAM WILL CONTINUE
TO READ SOURCE CARDS UNTIL A NEGATIVE SOURCE ID-NUMBER
IS READ FROM THE SOURCE CARDS.
# OF INDIVIDUAL SOURCES (4 DIGIT INTEGER) ? 0003

ENTER THE NUMBER OF RINGS IN THE GRID SYSTEM:
# OF RINGS (4 DIGIT INTEGER) ? 0003

ENTER, FROM SHORTEST TO LONGEST, THE DISTANCES
(IN METERS) FROM THE ORIGIN TO EACH RING.
INPUT YOUR DISTANCES USING A DECIMAL POINT TO DELINEATE
FRACTIONAL PORTIONS OR TO TERMINATE THE NUMBER.
(I.E.: 0000250.00 , 000000075. , OR 00000070.5
USE 10 DIGITS INCLUDING THE DECIMAL POINT)

DISTANCE #
1
ENTER (10 DIGIT DECIMAL) ? 00001000.0
DISTANCE #
2
ENTER (10 DIGIT DECIMAL) ? 00005000.0
DISTANCE #
3
ENTER (10 DIGIT DECIMAL) ? 00010000.0

ENTER TERRAIN ELEVATIONS IN FEET FOR EACH GRID
SYSTEM INTERCEPT, USING A DECIMAL POINT AS BEFORE.

INPUT FOR DIRECTION #
1
```

```
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000010.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000030.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000065.0
INPUT FOR DIRECTION #
2
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000010.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000035.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000070.0
INPUT FOR DIRECTION #
3
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000015.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000040.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000075.0
INPUT FOR DIRECTION #
4
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000015.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000045.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000080.0
INPUT FOR DIRECTION #
5
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000020.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000050.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000085.0
```

```
INPUT FOR DIRECTION #
6
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000020.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000055.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000090.0
INPUT FOR DIRECTION #
7
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000030.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000060.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000095.0
INPUT FOR DIRECTION #
8
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000030.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000065.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000095.0
INPUT FOR DIRECTION #
9
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000030.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000060.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000095.0
INPUT FOR DIRECTION #
10
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000030.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000055.0
AT RING #
```

```
3
ENTER (10 DIGIT DECIMAL) ? 00000095.0
INPUT FOR DIRECTION #
11
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000020.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000050.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000090.0
INPUT FOR DIRECTION #
12
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000020.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000045.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000090.0
INPUT FOR DIRECTION #
13
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000015.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000040.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000080.0
INPUT FOR DIRECTION #
14
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000015.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000035.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000080.0
INPUT FOR DIRECTION #
15
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000010.0
AT RING #
2
```

```
ENTER (10 DIGIT DECIMAL) ? 00000030.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000070.0
INPUT FOR DIRECTION #
16
AT RING #
1
ENTER (10 DIGIT DECIMAL) ? 00000010.0
AT RING #
2
ENTER (10 DIGIT DECIMAL) ? 00000025.0
AT RING #
3
ENTER (10 DIGIT DECIMAL) ? 00000070.0

ENTER THE AVERAGE ANNUAL AMBIENT AIR TEMPERATURE (IN DEGREES
KELVIN).  TEMPERATURES CAN BE FOUND IN NATIONAL CLIMATIC
CENTER SITE-SPECIFIC SUMMARIES.

ENTER (10 DIGIT DECIMAL) ? 285.000000


ENTER AVERAGE AFTERNOON MIXING LAYER HEIGHT (IN METERS).
MIXING HEIGHTS CAN BE FOUND IN HOLZWORTH (1972) AP-101.
ENTER THE HEIGHT AS AN INTEGER (MAXIMUM 10000).

ENTER AFTERNOON MIXING HEIGHT (5 DIGIT INTEGER) ? 01500


ENTER AVERAGE MORNING MIXING LAYER HEIGHT (IN METERS).
ENTER THE HEIGHT AS AN INTEGER (MAXIMUM 10000).

ENTER MORNING MIXING HEIGHT (5 DIGIT INTEGER) ? 00500

ENTER COEFFICIENT (PER SECOND) OF TIME DEPENDENT
POLLUTANT REMOVAL BY PHYSICAL OR CHEMICAL PROCESSES.
ENTER ZERO FOR NO DECAY.

ENTER (10 DIGIT DECIMAL) ? 0.00000000

ENTER THE FOLLOWING INFORMATION FOR SOURCE #
1

SOURCE IDENTIFICATION NUMBER:
ENTER (5 DIGIT INTEGER) ? 000001
ENTER (5 DIGIT INTEGER) ? 00001

SOURCE TYPE: 0 FOR STACK, 1 FOR VOLUME, 2 FOR AREA.
THIS INFORMATION WILL BE NEEDED FOR LATER USE.

ENTER (1 DIGIT INTEGER) ? 0
```

```
CARTESIAN X-COORDINATE AND Y-COORDINATE OF THE SOURCE
(IN METERS FROM ORIGIN).  (ENTER THE SOURCE CENTER
FOR VOLUME AND STACK SOURCES OR THE SOUTHWEST CORNER FOR
AREA SOURCES.)

ENTER X-COORDINATE VALUE (10 DIGIT DECIMAL) ? 0.00000000

ENTER Y-COORDINATE VALUE (10 DIGIT DECIMAL) ? 0.00000000

HEIGHT ABOVE THE GROUND (IN METERS) OF THE EMISSION POINT:
ENTER (7 DIGIT DECIMAL) ? 30.5000

ELEVATION (IN METERS) ABOVE MEAN SEA LEVEL OF THE GROUND AT THE
SOURCE LOCATION.  ENTER 0 IF NO TERRAIN ELEVATIONS WERE USED.
ENTER (7 DIGIT DECIMAL) ? 0.00000

THE FOLLOWING INPUTS DEPEND ON THE SOURCE TYPE:
FIRST INPUT:
FOR A STACK (0), ENTER STACK GAS EXIT TEMPERATURE
   (IN DEGREES KELVIN);
FOR A VOLUME (1), ENTER STANDARD DEVIATION OF THE
   CROSSWIND SOURCE DISTRIBUTION (IN METERS); OR
FOR AN AREA (2), ENTER THE WIDTH OF THE SOURCE
   (IN METERS).

ENTER (7 DIGIT DECIMAL) ? 400.000

SECOND INPUT:
FOR A STACK, ENTER STACK GAS EXIT VELOCITY
   (IN METERS PER SECOND);
FOR A VOLUME, ENTER STANDARD DEVIATION OF THE VERTICAL
   SOURCE DISTRIBUTION (IN METERS); OR
FOR AN AREA, ENTER 000000.

ENTER (7 DIGIT DECIMAL) ? 10.0000

THIRD INPUT:
FOR A STACK, ENTER INNER STACK DIAMETER (IN METERS); OR
FOR A VOLUME OR AN AREA, ENTER 000000.

ENTER (7 DIGIT DECIMAL) ? 2.50000

FOURTH INPUT:
FOR A STACK, THERE ARE TWO OPTIONS:
   ENTER 0, IF WAKE EFFECTS ARE NOT BEING CONSIDERED; OR
   ENTER HEIGHT ABOVE GROUND (IN METERS)
      OF THE BUILDING ADJACENT TO THE STACK FOR THE
      CONSIDERATION OF WAKE EFFECTS FOR THIS SOURCE.
FOR A VOLUME OR AN AREA, ENTER +00000.

ENTER (7 DIGIT DECIMAL) ? 0.00000

FIFTH INPUT:
```

```
FOR A STACK, THERE ARE TWO OPTIONS:
   ENTER 0 IF WAKE EFFECTS ARE NOT BEING CONSIDERED; OR
   ENTER WIDTH OF THE BUILDING (IN METERS)
      ADJACENT TO THE STACK FOR THE CONSIDERATION
      OF WAKE EFFECTS FOR THIS SOURCE.
FOR A VOLUME OR AN AREA, ENTER +00000.

ENTER (7 DIGIT DECIMAL) ? 0.00000

SIXTH INPUT:
FOR A STACK, THERE ARE TWO OPTIONS:
THIS INPUT IS A SUPER SQUAT BUILDING WAKE EFFECTS
OPTION.  THE 2 OPTIONS ARE:
1.  IF THE BUILDING WIDTH TO HEIGHT RATIO IS GREATER
    THAN 5 AND THIS INPUT IS 0, THE PROGRAM USES
    THE EQUATION OF LATERAL VIRTUAL DISTANCE THAT WILL
    PRODUCE THE UPPER BOUND OF CONCENTRATON OR
    DEPOSITION.  (SEE EQUATION (2-31) IN THE ISC USER'S
    GUIDE.)
2.  IF THIS INPUT IS 1, THE EQUATION OF LATERAL VIRTUAL
    DISTANCE THAT WILL PRODUCE THE LOWER BOUND OF THE
    CONCENTRATION OR DEPOSITION CALCULATION IS USED.
    (SEE EQUATION (2-33) IN THE ISC USER'S GUIDE.  THESE
    EQUATIONS ARE FOUND IN SECTION 2.4.11.D.)

FOR A VOLUME OR AN AREA, ENTER 2.

ENTER (1 DIGIT INTEGER) ? 0

ENTER NUMBER OF PARTICULATE SIZE CATEGORIES IN THE
POLLUTANT PARTICLE SIZE DISTRIBUTION.  ENTER 00
FOR GASES OR TO IGNORE DRY DEPOSITION.


ENTER (2 DIGIT INTEGER) ? 02

ENTER SETTLING VELOCITIES (IN METERS PER SECOND)
FOR EACH PARTICULATE SIZE CATEGORY.

VELOCITY #
1
ENTER (10 DIGIT DECIMAL) ? 0000.00075
VELOCITY #
2
ENTER (10 DIGIT DECIMAL) ? 0000.00012

ENTER MASS FRACTIONS OF THE PARTICLE SIZE DISTRIBUTION
FOR EACH CATEGORY.  THE SUM OF THESE FRACTIONS SHOULD
EQUAL 1 FOR 100% OF THE DISTRIBUTION.

FRACTION #
1
ENTER (10 DIGIT DECIMAL) ? 00000000.5
```

```
FRACTION #
2
ENTER (10 DIGIT DECIMAL) ? 00000000.5

ENTER SURFACE REFLECTION COEFFICIENTS (FRACTIONS 0 TO 1)
FOR EACH PARTICULATE SIZE CATEGORY.  A VALUE OF 0 IS
NO REFLECTION; A VALUE OF 1 IS COMPLETE REFLECTION.

REFLECTION COEFFICIENT #
1
ENTER (10 DIGIT DECIMAL) ? 00000000.5
REFLECTION COEFFICIENT #
2
ENTER (10 DIGIT DECIMAL) ? 00000000.5

ENTER THE EMISSION RATE OF THE POLLUTANT.  THE UNITS ARE:
   STACK SOURCE - GRAMS/SECOND
   VOLUME SOURCE - GRAMS/SECOND/CUBIC METER
   AREA SOURCE - GRAMS/SECOND/SQUARE METER
USE E10.2 FORMAT WHICH IS DESCRIBED IN THE ISC USER'S GUIDE.

ENTER (E10.2, RIGHT JUSTIFIED) ? 1.5000e+02
ENTER THE FOLLOWING INFORMATION FOR SOURCE #
2

SOURCE IDENTIFICATION NUMBER:
ENTER (5 DIGIT INTEGER) ? 00002

SOURCE TYPE: 0 FOR STACK, 1 FOR VOLUME, 2 FOR AREA.
THIS INFORMATION WILL BE NEEDED FOR LATER USE.

ENTER (1 DIGIT INTEGER) ? 2

CARTESIAN X-COORDINATE AND Y-COORDINATE OF THE SOURCE
(IN METERS FROM ORIGIN).  (ENTER THE SOURCE CENTER
FOR VOLUME AND STACK SOURCES OR THE SOUTHWEST CORNER FOR
AREA SOURCES.)

ENTER X-COORDINATE VALUE (10 DIGIT DECIMAL) ? 0.00000000

ENTER Y-COORDINATE VALUE (10 DIGIT DECIMAL) ? -25.000000

HEIGHT ABOVE THE GROUND (IN METERS) OF THE EMISSION POINT:
ENTER (7 DIGIT DECIMAL) ? 10.0000

ELEVATION (IN METERS) ABOVE MEAN SEA LEVEL OF THE GROUND AT THE
SOURCE LOCATION.  ENTER 0 IF NO TERRAIN ELEVATIONS WERE USED.
ENTER (7 DIGIT DECIMAL) ? 0.00000

THE FOLLOWING INPUTS DEPEND ON THE SOURCE TYPE:
FIRST INPUT:
FOR A STACK (0), ENTER STACK GAS EXIT TEMPERATURE
   (IN DEGREES KELVIN);
```

```
FOR A VOLUME (1), ENTER STANDARD DEVIATION OF THE
   CROSSWIND SOURCE DISTRIBUTION (IN METERS); OR
FOR AN AREA (2), ENTER THE WIDTH OF THE SOURCE
   (IN METERS).

ENTER (7 DIGIT DECIMAL) ? 50.0000

SECOND INPUT:
FOR A STACK, ENTER STACK GAS EXIT VELOCITY
   (IN METERS PER SECOND);
FOR A VOLUME, ENTER STANDARD DEVIATION OF THE VERTICAL
   SOURCE DISTRIBUTION (IN METERS); OR
FOR AN AREA, ENTER 000000.

ENTER (7 DIGIT DECIMAL) ? 000000.

THIRD INPUT:
FOR A STACK, ENTER INNER STACK DIAMETER (IN METERS); OR
FOR A VOLUME OR AN AREA, ENTER 000000.

ENTER (7 DIGIT DECIMAL) ? 000000.

FOURTH INPUT:
FOR A STACK, THERE ARE TWO OPTIONS:
   ENTER 0, IF WAKE EFFECTS ARE NOT BEING CONSIDERED; OR
   ENTER HEIGHT ABOVE GROUND (IN METERS)
      OF THE BUILDING ADJACENT TO THE STACK FOR THE
      CONSIDERATION OF WAKE EFFECTS FOR THIS SOURCE.
FOR A VOLUME OR AN AREA, ENTER +00000.

ENTER (7 DIGIT DECIMAL) ? +00000.

FIFTH INPUT:
FOR A STACK, THERE ARE TWO OPTIONS:
   ENTER 0 IF WAKE EFFECTS ARE NOT BEING CONSIDERED; OR
   ENTER WIDTH OF THE BUILDING (IN METERS)
      ADJACENT TO THE STACK FOR THE CONSIDERATION
      OF WAKE EFFECTS FOR THIS SOURCE.
FOR A VOLUME OR AN AREA, ENTER +00000.

ENTER (7 DIGIT DECIMAL) ? +00000.

SIXTH INPUT:
FOR A STACK, THERE ARE TWO OPTIONS:
THIS INPUT IS A SUPER SQUAT BUILDING WAKE EFFECTS
OPTION.  THE 2 OPTIONS ARE:
1.  IF THE BUILDING WIDTH TO HEIGHT RATIO IS GREATER
    THAN 5 AND THIS INPUT IS 0, THE PROGRAM USES
    THE EQUATION OF LATERAL VIRTUAL DISTANCE THAT WILL
    PRODUCE THE UPPER BOUND OF CONCENTRATON OR
    DEPOSITION.  (SEE EQUATION (2-31) IN THE ISC USER'S
    GUIDE.)
2.  IF THIS INPUT IS 1, THE EQUATION OF LATERAL VIRTUAL
```

```
    DISTANCE THAT WILL PRODUCE THE LOWER BOUND OF THE
    CONCENTRATION OR DEPOSITION CALCULATION IS USED.
    (SEE EQUATION (2-33) IN THE ISC USER'S GUIDE.  THESE
    EQUATIONS ARE FOUND IN SECTION 2.4.11.D.)

FOR A VOLUME OR AN AREA, ENTER 2.

ENTER (1 DIGIT INTEGER) ? 2

ENTER NUMBER OF PARTICULATE SIZE CATEGORIES IN THE
POLLUTANT PARTICLE SIZE DISTRIBUTION.  ENTER 00
FOR GASES OR TO IGNORE DRY DEPOSITION.

ENTER (2 DIGIT INTEGER) ? 02

ENTER SETTLING VELOCITIES (IN METERS PER SECOND)
FOR EACH PARTICULATE SIZE CATEGORY.

VELOCITY #
1
ENTER (10 DIGIT DECIMAL) ? 0000.00075
VELOCITY #
2
ENTER (10 DIGIT DECIMAL) ? 0000.00012

ENTER MASS FRACTIONS OF THE PARTICLE SIZE DISTRIBUTION
FOR EACH CATEGORY.  THE SUM OF THESE FRACTIONS SHOULD
EQUAL 1 FOR 100% OF THE DISTRIBUTION.

FRACTION #
1
ENTER (10 DIGIT DECIMAL) ? 00000000.5
FRACTION #
2
ENTER (10 DIGIT DECIMAL) ? 00000000.5

ENTER SURFACE REFLECTION COEFFICIENTS (FRACTIONS 0 TO 1)
FOR EACH PARTICULATE SIZE CATEGORY.  A VALUE OF 0 IS
NO REFLECTION; A VALUE OF 1 IS COMPLETE REFLECTION.

REFLECTION COEFFICIENT #
1
ENTER (10 DIGIT DECIMAL) ? 00000000.5
REFLECTION COEFFICIENT #
2
ENTER (10 DIGIT DECIMAL) ? 00000000.5

ENTER THE EMISSION RATE OF THE POLLUTANT.  THE UNITS ARE:
   STACK SOURCE - GRAMS/SECOND
   VOLUME SOURCE - GRAMS/SECOND/CUBIC METER
   AREA SOURCE - GRAMS/SECOND/SQUARE METER
USE E10.2 FORMAT WHICH IS DESCRIBED IN THE ISC USER'S GUIDE.
```

```
ENTER (E10.2, RIGHT JUSTIFIED) ? 6.0000e-01
ENTER THE FOLLOWING INFORMATION FOR SOURCE #
3

SOURCE IDENTIFICATION NUMBER:
ENTER (5 DIGIT INTEGER) ? 00003

SOURCE TYPE: 0 FOR STACK, 1 FOR VOLUME, 2 FOR AREA.
THIS INFORMATION WILL BE NEEDED FOR LATER USE.

ENTER (1 DIGIT INTEGER) ? 2

CARTESIAN X-COORDINATE AND Y-COORDINATE OF THE SOURCE
(IN METERS FROM ORIGIN).  (ENTER THE SOURCE CENTER
FOR VOLUME AND STACK SOURCES OR THE SOUTHWEST CORNER FOR
AREA SOURCES.)

ENTER X-COORDINATE VALUE (10 DIGIT DECIMAL) ? -50.000000

ENTER Y-COORDINATE VALUE (10 DIGIT DECIMAL) ? -25.000000

HEIGHT ABOVE THE GROUND (IN METERS) OF THE EMISSION POINT:
ENTER (7 DIGIT DECIMAL) ? 10.0000

ELEVATION (IN METERS) ABOVE MEAN SEA LEVEL OF THE GROUND AT THE
SOURCE LOCATION.  ENTER 0 IF NO TERRAIN ELEVATIONS WERE USED.
ENTER (7 DIGIT DECIMAL) ? 0.00000

THE FOLLOWING INPUTS DEPEND ON THE SOURCE TYPE:
FIRST INPUT:
FOR A STACK (0), ENTER STACK GAS EXIT TEMPERATURE
   (IN DEGREES KELVIN);
FOR A VOLUME (1), ENTER STANDARD DEVIATION OF THE
   CROSSWIND SOURCE DISTRIBUTION (IN METERS); OR
FOR AN AREA (2), ENTER THE WIDTH OF THE SOURCE
   (IN METERS).

ENTER (7 DIGIT DECIMAL) ? 50.0000

SECOND INPUT:
FOR A STACK, ENTER STACK GAS EXIT VELOCITY
   (IN METERS PER SECOND);
FOR A VOLUME, ENTER STANDARD DEVIATION OF THE VERTICAL
   SOURCE DISTRIBUTION (IN METERS); OR
FOR AN AREA, ENTER 000000.

ENTER (7 DIGIT DECIMAL) ? 000000.

THIRD INPUT:
FOR A STACK, ENTER INNER STACK DIAMETER (IN METERS); OR
FOR A VOLUME OR AN AREA, ENTER 000000.

ENTER (7 DIGIT DECIMAL) ? 000000.
```

```
FOURTH INPUT:
FOR A STACK, THERE ARE TWO OPTIONS:
   ENTER 0, IF WAKE EFFECTS ARE NOT BEING CONSIDERED; OR
   ENTER HEIGHT ABOVE GROUND (IN METERS)
      OF THE BUILDING ADJACENT TO THE STACK FOR THE
      CONSIDERATION OF WAKE EFFECTS FOR THIS SOURCE.
FOR A VOLUME OR AN AREA, ENTER +00000.

ENTER (7 DIGIT DECIMAL) ? +00000.

FIFTH INPUT:
FOR A STACK, THERE ARE TWO OPTIONS:
   ENTER 0 IF WAKE EFFECTS ARE NOT BEING CONSIDERED; OR
   ENTER WIDTH OF THE BUILDING (IN METERS)
      ADJACENT TO THE STACK FOR THE CONSIDERATION
      OF WAKE EFFECTS FOR THIS SOURCE.
FOR A VOLUME OR AN AREA, ENTER +00000.

ENTER (7 DIGIT DECIMAL) ? +00000.

SIXTH INPUT:
FOR A STACK, THERE ARE TWO OPTIONS:
THIS INPUT IS A SUPER SQUAT BUILDING WAKE EFFECTS
OPTION.  THE 2 OPTIONS ARE:
1.  IF THE BUILDING WIDTH TO HEIGHT RATIO IS GREATER
    THAN 5 AND THIS INPUT IS 0, THE PROGRAM USES
    THE EQUATION OF LATERAL VIRTUAL DISTANCE THAT WILL
    PRODUCE THE UPPER BOUND OF CONCENTRATON OR
    DEPOSITION.  (SEE EQUATION (2-31) IN THE ISC USER'S
    GUIDE.)
2.  IF THIS INPUT IS 1, THE EQUATION OF LATERAL VIRTUAL
    DISTANCE THAT WILL PRODUCE THE LOWER BOUND OF THE
    CONCENTRATION OR DEPOSITION CALCULATION IS USED.
    (SEE EQUATION (2-33) IN THE ISC USER'S GUIDE.  THESE
    EQUATIONS ARE FOUND IN SECTION 2.4.11.D.)

FOR A VOLUME OR AN AREA, ENTER 2.

ENTER (1 DIGIT INTEGER) ? 2

ENTER NUMBER OF PARTICULATE SIZE CATEGORIES IN THE
POLLUTANT PARTICLE SIZE DISTRIBUTION.  ENTER 00
FOR GASES OR TO IGNORE DRY DEPOSITION.

ENTER (2 DIGIT INTEGER) ? 02

ENTER SETTLING VELOCITIES (IN METERS PER SECOND)
FOR EACH PARTICULATE SIZE CATEGORY.

VELOCITY #
1
ENTER (10 DIGIT DECIMAL) ? 0000.00075
```

```
VELOCITY #
2
ENTER (10 DIGIT DECIMAL) ? 0000.00012

ENTER MASS FRACTIONS OF THE PARTICLE SIZE DISTRIBUTION
FOR EACH CATEGORY.  THE SUM OF THESE FRACTIONS SHOULD
EQUAL 1 FOR 100% OF THE DISTRIBUTION.

FRACTION #
1
ENTER (10 DIGIT DECIMAL) ? 00000000.5
FRACTION #
2
ENTER (10 DIGIT DECIMAL) ? 00000000.5

ENTER SURFACE REFLECTION COEFFICIENTS (FRACTIONS 0 TO 1)
FOR EACH PARTICULATE SIZE CATEGORY.  A VALUE OF 0 IS
NO REFLECTION; A VALUE OF 1 IS COMPLETE REFLECTION.

REFLECTION COEFFICIENT #
1
ENTER (10 DIGIT DECIMAL) ? 00000000.5
REFLECTION COEFFICIENT #
2
ENTER (10 DIGIT DECIMAL) ? 00000000.5

ENTER THE EMISSION RATE OF THE POLLUTANT.  THE UNITS ARE:
   STACK SOURCE - GRAMS/SECOND
   VOLUME SOURCE - GRAMS/SECOND/CUBIC METER
   AREA SOURCE - GRAMS/SECOND/SQUARE METER
USE E10.2 FORMAT WHICH IS DESCRIBED IN THE ISC USER'S GUIDE.

ENTER (E10.2, RIGHT JUSTIFIED) ? 6.0000e-01
TO SAVE THIS ISC DATA WHICH YOU HAVE JUST CREATED,
USE THE SAME PROCEDURE AS WITH THE CONEX FILE (EXEC5).

REMEMBER!! EITHER REPLACE YOUR ISC FILES WHEN PROMPTED
OR SCRATCH THEM WHEN FINISHED WITH THEM.

NAMES ALREADY IN USE:

CN.EPATOE.AEHW.LIB
APORT
BRECK
CONEX1
DIREC2
EXECB
EXEC0
EXEC1
EXEC2
EXEC3
EXEC4
EXEC5
```

```
EXEC6
EXEC7
GUIDE3
GUIDE5
GUIDE6
IEBCOPY
IEBCUST
IEBGENER
IEBGEN2
ISCINP
ISCLT
IUCALC1
LOGON
RD803
SERCH3
STAR2
WARTS
WELMA5
WELMA6
WIND

FILE NAME 1-6 CHARACTERS, BEGINNING WITH ALPHABETIC CHARACTER.
ENTER ISC FILE NAME ? guide6
REMEMBER THIS ISC FILE NAME FOR USE IN EXEC7.
MEMBER GUIDE6 ALREADY IN LIB
REPLACE? yes
MEMBER GUIDE6 REPLACED IN LIB
DATA INPUT FOR ISC
    1.     ISC RUN FOR USERS GUIDE
    2.      1 2 2 1 1 3 2 0 1 0 0 0 0 0-3 0 0 1 0 0 1 1
    3.     0003   00003  16   0   1   6   6  16   0
    4.     MICROGRAMS PER CUBIC METER                GRAMS PER SECOND
    5.     00001000.000005000.000010000.0
    6.     000000000.00000022.5
    7.     00000010.000000030.000000065.0
    8.     00000010.000000035.000000070.0
    9.     00000015.000000040.000000075.0
   10.     00000015.000000045.000000080.0
   11.     00000020.000000050.000000085.0
   12.     00000020.000000055.000000090.0
   13.     00000030.000000060.000000095.0
   14.     00000030.000000065.000000095.0
   15.     00000030.000000060.000000095.0
   16.     00000030.000000055.000000095.0
   17.     00000020.000000050.000000090.0
   18.     00000020.000000045.000000090.0
   19.     00000015.000000040.000000080.0
   20.     00000015.000000035.000000080.0
   21.     00000010.000000030.000000070.0
   22.     00000010.000000025.000000070.0
   23.     285.000000285.000000285.000000285.000000285.000000285.000000
   24.     002250.000002250.000002250.000002250.000002250.000002250.000
   25.     001500.000001500.000001500.000001500.000001500.000001500.000
```

```
26.     001500.000001500.000001500.000001500.000001500.000001500.000
27.     001250.000001250.000001250.000001250.000001250.000001250.000
28.     000500.000000500.000000500.000000500.000000500.000000500.000
29.     010000.000010000.000010000.000010000.000010000.000010000.000
30.     000000000.
31.     000000000.
32.     000000000.
33.     000000000.
34.     000000000.
35.     000000000.
36.     000000000.000000000.000000010.000000000.000000000.000000000.0.00000000
37.     000000000.
38.     000000000.
39.     000000000.
40.     000000000.
41.     000000000.
42.     000000000.
43.     000000000.
44.     000000000.
45.     000000000.
46.     000010000.000000000.0000000030.50000.00000400.00010.00002.500000.000000.00000002
47.     0000.000750000.00012
48.     00000000.500000000.5
49.     00000000.500000000.5
50.     1.5000E+02
51.     000020200.00000000-25.00000010.00000.0000050.0000                          02
52.     0000.000750000.00012
53.     00000000.500000000.5
54.     00000000.500000000.5
55.     6.0000E-01
56.     00003020-50.000000-25.00000010.00000.0000050.0000                          02
57.     0000.000750000.00012
58.     00000000.500000000.5
59.     00000000.500000000.5
60.     6.0000E-01
?
```

Step 7:

```
? exe fro $exec5
POLLUTION DATA: ENTER 0 IF CONCENTRATION DATA ARE
POLLUTION SPECIFIC.  ENTER 1 IF NOT.
ENTER (1 DIGIT INTEGER) ? 1
ENTER 0 IF GRID AND CENTROID RADII ARE EQUAL, 1 IF NOT.
ENTER (1 DIGIT INTEGER) ? 1
ENTER 0 TO GET TABLES FOR EACH SOURCE PLUS ALL SOURCES
COMBINED.  ENTER 1 TO GET TABLES FOR ALL SOURCES
COMBINED ONLY.
ENTER 0 OR 1 (1 DIGIT INTEGER) ? 0
TABLES SELECTION: ANSWER Y OR N TO PROMPTS.
*****GRID TABLES, GRID COORDINATE SYSTEM******
CONCENTRATIONS AT EACH POINT (Y/N) ? y
MAX & MIN VALUES (Y/N) ? y
RELATIVE TO MAX VALUES (Y/N) ? y
CONCENTRATION RANKING IN DESCENDING ORDER (Y/N) ? y
CONTRIBUTION OF EACH SOURCE TO CONCENTRATION AT EACH POINT
(Y/N) ? y
*****CENTROID TABLES, CENTROID COORDINATE SYSTEM*****
CONCENTRATIONS IN EACH SEGMENT (Y/N) ? y
MAX & MIN VALUES (Y/N) ? y
RELATIVE TO MAX VALUES (Y/N) ? y
CONCENTRATION RANKING IN DESCENDING ORDER (Y/N) ? y
CONTRIBUTION OF EACH SOURCE TO CONCENTRATION IN EACH SEGMENT
(Y/N) ? y
POPULATION TABLE (Y/N) ? y
*****EXPOSURE TABLES, CENTROID COORDINATE SYSTEM*****
EXPOSURES IN EACH SEGMENT (Y/N) ? y
MAX & MIN VALUES (Y/N) ? y
RELATIVE TO MAX VALUES (Y/N) ? y
EXPOSURE RANKING IN DESCENDING ORDER (Y/N) ? y
CONTRIBUTION OF EACH SOURCE TO EXPOSURE IN EACH SEGMENT
(Y/N) ? y
TOTAL EXPOSURE SUMMARY (Y/N) ? y
EXPOSURE IN EACH SECTOR (Y/N) ? y
EXPOSURE IN EACH RADIAL BAND (Y/N) ? y
EXPOSURE SUMMARY BY CONCENTRATION LEVEL (Y/N) ? y
ENTER TITLE, 40 CHARACTERS OR LESS.
ENTER?    the sample site for the users guide
ENTER NUMBER OF SOURCES, POLLUTANTS, AND RINGS:
ENTER NUMBER OF SOURCES (3 DIGIT INTEGER) ? 002
ENTER NUMBER OF POLLUTANTS (3 DIGIT INTEGER) ? 002
ENTER NUMBER OF RINGS (3 DIGIT INTEGER) ? 003
ENTER POLLUTANT INFORMATION:
POLLUTANT NUMBER
1
ENTER NAME (8 CHARACTERS OR LESS) ? pollut 1
ENTER EMISSION RATE FROM EACH SOURCE USING E10.2 FORMAT
(THE EXPONENTIAL PORTION MUST BE RIGHT JUSTIFIED).  UNITS
ARE GRAMS/SECOND FOR A STACK, GRAMS/SECOND/SQUARE METER FOR
AN AREA, OR GRAMS/SECOND/CUBIC METER FOR A VOLUME.
ENTER EMISSION RATE FROM SOURCE NUMBER
```

```
1
RATE (E10.2 FORMAT, RIGHT ADJUSTED) ? 1.0000e+02
ENTER EMISSION RATE FROM SOURCE NUMBER
2
RATE (E10.2 FORMAT, RIGHT ADJUSTED) ? 1.0000e-01
POLLUTANT NUMBER
2
ENTER NAME (8 CHARACTERS OR LESS) ? pollut 2
ENTER EMISSION RATE FROM EACH SOURCE USING E10.2 FORMAT
(THE EXPONENTIAL PORTION MUST BE RIGHT JUSTIFIED).  UNITS
ARE GRAMS/SECOND FOR A STACK, GRAMS/SECOND/SQUARE METER FOR
AN AREA, OR GRAMS/SECOND/CUBIC METER FOR A VOLUME.
ENTER EMISSION RATE FROM SOURCE NUMBER
1
RATE (E10.2 FORMAT, RIGHT ADJUSTED) ? 5.0000e+01
ENTER EMISSION RATE FROM SOURCE NUMBER
2
RATE (E10.2 FORMAT, RIGHT ADJUSTED) ? 5.0000e-01
ENTER SOURCE INFORMATION:
ENTER NAME OF SOURCE COMBINATION NUMBER
1
ENTER NAME (12 CHARACTERS OR LESS) ? stack source
ENTER THE NUMBER OF INDIVIDUAL SOURCES THAT MAKE UP THIS
COMBINATION (3 DIGIT INTEGER) ? 001
TOTAL EMISSION RATE (E10.2 FORMAT) ? 1.5000e+02
ENTER NAME OF SOURCE COMBINATION NUMBER
2
ENTER NAME (12 CHARACTERS OR LESS) ? area source
ENTER THE NUMBER OF INDIVIDUAL SOURCES THAT MAKE UP THIS
COMBINATION (3 DIGIT INTEGER) ? 002
TOTAL EMISSION RATE (E10.2 FORMAT) ? 6.0000e-01
TO SAVE THIS CONEX DATA WHICH YOU HAVE JUST INPUT:
1.  CHOOSE AN ALPHANUMERIC NAME 1-6 CHARACTERS LONG
    WHICH BEGINS WITH AN ALPHABETIC CHARACTER.

2.  IF YOU HAVE PREVIOUSLY USED THIS NAME, YOU WILL
    BE PROMPTED WITH THE MESSAGE THAT IT IS ALREADY
    IN CN.EPATOE.AEHW.LIB, REPLACE?  THERE ARE NOW
    TWO OPTIONS:
    A.  TYPE 'YES' (WITHOUT THE APOSTROPHES), WHICH
        WILL REPLACE YOUR PREVIOUS FILE WITH YOUR
        NEW ONE.
    B.  HIT A RETURN WHICH WILL KICK YOU OUT OF EXEC5
        AND YOU WILL HAVE TO INPUT THE CONEX FILE AGAIN.
    SO, EITHER CHOOSE A NEW NAME, OR BE READY TO DELETE
    YOUR OLD FILE.

3.  LISTED BELOW ARE NAMES WHICH ARE ALREADY IN USE AND
    CANNOT BE USED BY YOU, UNLESS THEY ARE NAMES YOU
    HAVE USED AND ARE READY TO DELETE.

4.  IMPORTANT!! EITHER REPLACE YOUR CONEX FILES WHEN
    PROMPTED, OR SCRATCH THEM WHEN FINISHED WITH THEM.
```

```
    TO SCRATCH AN OLD FILE USE THE COMMAND:
         SCRATCH $<NAME>
    WHERE <NAME> IS THE FILE YOU WISH TO DELETE.
    USE THIS COMMAND WHEN IN COMMAND MODE ONLY.
    I.E.: BEING PROMPTED BY -  COMMAND?

NAMES ALREADY IN USE:

CN.EPATOE.AEHW.LIB
APORT
BRECK
CONEX1
DIREC2
EXECB
EXEC0
EXEC1
EXEC2
EXEC3
EXEC4
EXEC5
EXEC6
EXEC7
GUIDE3
GUIDE5
GUIDE6
IEBCOPY
IEBCUST
IEBGENER
IEBGEN2
ISCINP
ISCLT
IUCALC1
LOGON
RD803
SERCH3
STAR2
WARTS
WELMA5
WELMA6
WIND

FILE NAME (1-6 CHARACTERS, BEGINNING WITH ALPHABETIC CHARACTER):
ENTER CONEX FILE NAME ? guide5
REMEMBER THIS CONEX FILE NAME FOR USE IN EXEC7.
MEMBER GUIDE5 ALREADY IN LIB
REPLACE? yes
MEMBER GUIDE5 REPLACED IN LIB
DATA INPUT FOR CONEX
    2.       2  1  0  1  0
    3.      0
    4.      0 0 0 0 0
    5.      0 0 0 0 0 0
    6.      0 0 0 0 0 0 0 0 0 0
```

```
 7.     AT THE SAMPLE SITE FOR THE USERS GUIDE
 8.     002002003016
 9.     POLLUT 1
10.     1.0000E+02
11.     1.0000E-01
12.     POLLUT 2
13.     5.0000E+01
14.     5.0000E-01
15.     STACK SOURCE0011.5000E+02
16.     AREA SOURCE 0026.0000E-01
17.     /*
18.     /*
19.     //
EXEC END
?
```

Step 8:

```
? exe fro $exec7
THIS EXEC FILE SETS UP THE ISC/CONEX JOB STREAM.
YOU SHOULD HAVE ALREADY DONE THE FOLLOWING:
1. CREATED A CATALOGED MET DATA SET USING EXEC0/EXEC2
2. CREATED A CATALOGED POP DATA SET USING EXEC3, EXEC4
3. CREATED THE CONEX DATA SET USING EXEC5
4. CREATED THE ISC DATA SET USING EXEC6

ENTER THE NAME OF THE ISC DATA SET CREATED WITH EXEC6:
ENTER? guide6

ENTER THE 4 DIGIT HEADER NUMBER AND 2 DIGIT TIME CODE
USED IN EXEC2 :
ENTER (6 DIGIT INTEGER) ? 109117

ENTER THE NAME OF THE CONEX DATA SET CREATED WITH EXEC5:
ENTER? guide5

ENTER THE NAME OF THE POP DATA SET CREATED WITH
EXEC4 (GRID POP FILE):
ENTER? guide3

YOU HAVE FINISHED SETTING UP THE ISC/CONEX RUN
DO YOU WANT TO RUN (Y/N) ?
ENTER? y
PRIORITY 2, 3, OR 4?
ENTER (1 DIGIT INTEGER) ? 4
JOB 2696 EPATOEIS SUBMITTED
?
```

APPENDIX E

OUTPUT TABLES PRODUCED BY CONEX FOR THE SAMPLE PROBLEM

This appendix contains output tables that are produced by CONEX. Values supplied by the user in the sample problem should produce these data. Any discrepancies that may result are caused either by input error or system malfunction. Output for each EXEC step should be consulted to determine the problem.

Exhibit E.1

1 POPULATION DISTRIBUTION BY SEGMENT FOR THE SAMPLE SITE FOR THE USERS GUIDE

	LOCATION OF SEGMENT CENTROID:	
DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 3000.00	7500.00
0.0	3737.	16748.
22.50	14834.	22205.
45.00	7117.	34388.
67.50	2637.	43606.
90.00	33710.	28942.
112.50	26922.	10389.
135.00	7518.	20023.
157.50	18566.	24214.
180.00	6418.	14908.
202.50	14178.	12221.
225.00	6960.	21363.
247.50	14704.	9146.
270.00	19509.	17974.
292.50	2984.	18519.
315.00	5955.	18937.
337.50	14162.	16932.

Exhibit E.2

1 ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS (MICROGRAMS PER CUBIC METER) AT GRID INTERCEPTS,
POLLUT 1 EMISSIONS FROM AREA SOURCE AT THE SAMPLE SITE FOR THE USERS GUIDE

	LOCATION OF GRID INTERCEPT:		
DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS		
	1000.00	5000.00	10000.00
0.0	7.28E+02	5.59E+01	1.83E+01
22.50	5.71E+02	3.93E+01	1.26E+01
45.00	5.03E+02	3.43E+01	1.10E+01
67.50	5.22E+02	3.39E+01	1.08E+01
90.00	6.82E+02	4.88E+01	1.58E+01
112.50	4.07E+02	2.58E+01	8.18E+00
135.00	3.46E+02	2.34E+01	7.51E+00
157.50	3.62E+02	2.41E+01	7.73E+00
180.00	4.61E+02	3.34E+01	1.08E+01
202.50	3.33E+02	2.21E+01	7.08E+00
225.00	2.80E+02	1.89E+01	6.05E+00
247.50	3.09E+02	2.03E+01	6.44E+00
270.00	4.13E+02	2.85E+01	9.16E+00
292.50	4.05E+02	2.69E+01	8.56E+00
315.00	4.52E+02	3.29E+01	1.07E+01
337.50	4.16E+02	2.60E+01	8.21E+00

Exhibit E.3

1 LOCATIONS AND VALUES OF MAXIMUM ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS OF POLLUT 1

SOURCE	CONCENTRATION, MICROGRAMS PER CUBIC METER	LOCATION OF GRID INTERCEPT	
		DEGREES FROM NORTH	METERS FROM ORIGIN
STACK SOURCE	2.82E+01	0.0	1000.00
AREA SOURCE	7.28E+02	0.0	1000.00
ALL SOURCES	7.56E+02	0.0	1000.00

1 LOCATIONS AND VALUES OF MINIMUM ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS OF POLLUT 1

SOURCE	CONCENTRATION, MICROGRAMS PER CUBIC METER	LOCATION OF GRID INTERCEPT	
		DEGREES FROM NORTH	METERS FROM ORIGIN
STACK SOURCE	8.01E-01	225.00	10000.00
AREA SOURCE	6.05E+00	225.00	10000.00
ALL SOURCES	6.85E+00	225.00	10000.00

Exhibit E.4

1 RELATIVE (TO MAXIMUM) ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS AT GRID INTERCEPTS,
POLLUT 1 EMISSIONS FROM AREA SOURCE AT THE SAMPLE SITE FOR THE USERS GUIDE

	LOCATION OF GRID INTERCEPT:		
DIRECTION, DEGREES	DISTANCE FROM ORIGIN, METERS		
FROM NORTH	1000.00	5000.00	10000.00
0.0	1.000	0.077	0.025
22.50	0.784	0.054	0.017
45.00	0.692	0.047	0.015
67.50	0.717	0.047	0.015
90.00	0.938	0.067	0.022
112.50	0.560	0.035	0.011
135.00	0.476	0.032	0.010
157.50	0.497	0.033	0.011
180.00	0.634	0.046	0.015
202.50	0.457	0.030	0.010
225.00	0.385	0.026	0.008
247.50	0.425	0.028	0.009
270.00	0.568	0.039	0.013
292.50	0.556	0.037	0.012
315.00	0.622	0.045	0.015
337.50	0.572	0.036	0.011

Exhibit E.5

1 RANKING OF ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS AT GRID INTERCEPTS, AREA SOURCE EMISSIONS OF POLLUT 1 AT THE SAMPLE SITE FOR THE USERS GUIDE

RANK	LOCATION OF INTERCEPT		CONCENTRATION, MICROGRAMS PER CUBIC METER
	DEGREES FROM NORTH	METERS FROM ORIGIN	
1	0.0	1000.00	7.28E+02
2	90.00	1000.00	6.82E+02
0	90 PERCENT LEVEL		
0	80 PERCENT LEVEL		
3	22.50	1000.00	5.71E+02
4	67.50	1000.00	5.22E+02
0	70 PERCENT LEVEL		
5	45.00	1000.00	5.03E+02
6	180.00	1000.00	4.61E+02
7	315.00	1000.00	4.52E+02
0	60 PERCENT LEVEL		
8	337.50	1000.00	4.16E+02
9	270.00	1000.00	4.13E+02
10	112.50	1000.00	4.07E+02
11	292.50	1000.00	4.05E+02
0	50 PERCENT LEVEL		
12	157.50	1000.00	3.62E+02
13	135.00	1000.00	3.46E+02
14	202.50	1000.00	3.33E+02
15	247.50	1000.00	3.09E+02
0	40 PERCENT LEVEL		
16	225.00	1000.00	2.80E+02
0	30 PERCENT LEVEL		
0	20 PERCENT LEVEL		

Exhibit E.5 (continued)

0---------- 10 PERCENT LEVEL ----------

17	0.0	5000.00	5.59E+01
18	90.00	5000.00	4.88E+01
19	22.50	5000.00	3.93E+01
20	45.00	5000.00	3.43E+01
21	67.50	5000.00	3.39E+01
22	180.00	5000.00	3.34E+01
23	315.00	5000.00	3.29E+01
24	270.00	5000.00	2.85E+01
25	292.50	5000.00	2.69E+01
26	337.50	5000.00	2.60E+01
27	112.50	5000.00	2.58E+01
28	157.50	5000.00	2.41E+01
29	135.00	5000.00	2.34E+01
30	202.50	5000.00	2.21E+01
31	247.50	5000.00	2.03E+01
32	225.00	5000.00	1.89E+01
33	0.0	10000.00	1.83E+01
34	90.00	10000.00	1.58E+01
35	22.50	10000.00	1.26E+01
36	45.00	10000.00	1.10E+01
37	180.00	10000.00	1.08E+01
38	67.50	10000.00	1.08E+01
39	315.00	10000.00	1.07E+01
40	270.00	10000.00	9.16E+00
41	292.50	10000.00	8.56E+00
42	337.50	10000.00	8.21E+00
43	112.50	10000.00	8.18E+00
44	157.50	10000.00	7.73E+00
45	135.00	10000.00	7.51E+00
46	202.50	10000.00	7.08E+00
47	247.50	10000.00	6.44E+00
48	225.00	10000.00	6.05E+00

Exhibit E.6

1 FRACTIONAL CONTRIBUTION OF EACH SOURCE TO THE ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATION OF POLLUT 1
AT THE GRID INTERCEPTS LOCATED 1000.00 METERS FROM THE ORIGIN AT THE SAMPLE SITE FOR THE USERS GUIDE

INTERCEPT DIRECTION, DEGREES FROM NORTH	STACK SOURCE	AREA SOURCE
0.0	0.0373	0.9627
22.50	0.0327	0.9673
45.00	0.0297	0.9703
67.50	0.0277	0.9723
90.00	0.0349	0.9651
112.50	0.0335	0.9665
135.00	0.0345	0.9655
157.50	0.0339	0.9661
180.00	0.0329	0.9671
202.50	0.0291	0.9709
225.00	0.0316	0.9684
247.50	0.0280	0.9720
270.00	0.0309	0.9691
292.50	0.0284	0.9716
315.00	0.0307	0.9693
337.50	0.0241	0.9759

Exhibit E.7

1 ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS (MICROGRAMS PER CUBIC METER) AT SEGMENT CENTROIDS,
POLLUT 1 EMISSIONS FROM ALL SOURCES AT THE SAMPLE SITE FOR THE USERS GUIDE

	LOCATION OF SEGMENT CENTROID:	
DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS	
	3000.00	7500.00
0.0	1.36E+02	3.28E+01
22.50	9.89E+01	2.27E+01
45.00	8.63E+01	1.98E+01
67.50	8.65E+01	1.95E+01
90.00	1.22E+02	2.84E+01
112.50	6.68E+01	1.48E+01
135.00	5.93E+01	1.35E+01
157.50	6.13E+01	1.39E+01
180.00	8.28E+01	1.95E+01
202.50	5.61E+01	1.27E+01
225.00	4.78E+01	1.09E+01
247.50	5.14E+01	1.16E+01
270.00	7.16E+01	1.65E+01
292.50	6.80E+01	1.54E+01
315.00	8.11E+01	1.91E+01
337.50	6.68E+01	1.48E+01

Exhibit E.8

1 LOCATIONS AND VALUES OF MAXIMUM ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS OF POLLUT 1

SOURCE	CONCENTRATION, MICROGRAMS PER CUBIC METER	LOCATION OF SEGMENT CENTROID	
		DEGREES FROM NORTH	METERS FROM ORIGIN
STACK SOURCE	1.03E+01	0.0	3000.00
AREA SOURCE	1.26E+02	0.0	3000.00
ALL SOURCES	1.36E+02	0.0	3000.00

1 LOCATIONS AND VALUES OF MINIMUM ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS OF POLLUT 1

SOURCE	CONCENTRATION, MICROGRAMS PER CUBIC METER	LOCATION OF SEGMENT CENTROID	
		DEGREES FROM NORTH	METERS FROM ORIGIN
STACK SOURCE	1.19E+00	225.00	7500.00
AREA SOURCE	9.71E+00	225.00	7500.00
ALL SOURCES	1.09E+01	225.00	7500.00

Exhibit E.9

1 RELATIVE (TO MAXIMUM) ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS AT SEGMENT CENTROIDS,
POLLUT 1 EMISSIONS FROM ALL SOURCES AT THE SAMPLE SITE FOR THE USERS GUIDE

	LOCATION OF SEGMENT CENTROID:	
DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 3000.00	7500.00
0.0	1.000	0.240
22.50	0.725	0.167
45.00	0.632	0.145
67.50	0.634	0.143
90.00	0.892	0.208
112.50	0.489	0.109
135.00	0.434	0.099
157.50	0.449	0.102
180.00	0.607	0.143
202.50	0.411	0.093
225.00	0.350	0.080
247.50	0.377	0.085
270.00	0.525	0.121
292.50	0.498	0.113
315.00	0.594	0.140
337.50	0.489	0.108

Exhibit E.10

1 RANKING OF ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATIONS AT SEGMENT CENTROIDS, ALL SOURCES EMISSIONS OF POLLUT 1 AT THE SAMPLE SITE FOR THE USERS GUIDE

RANK	LOCATION OF CENTROID		CONCENTRATION, MICROGRAMS PER CUBIC METER
	DEGREES FROM NORTH	METERS FROM ORIGIN	
1	0.0	3000.00	1.36E+02
0---------- 90 PERCENT LEVEL ----------			
2	90.00	3000.00	1.22E+02
0---------- 80 PERCENT LEVEL ----------			
3	22.50	3000.00	9.89E+01
0---------- 70 PERCENT LEVEL ----------			
4	67.50	3000.00	8.65E+01
5	45.00	3000.00	8.63E+01
6	180.00	3000.00	8.28E+01
0---------- 60 PERCENT LEVEL ----------			
7	315.00	3000.00	8.11E+01
8	270.00	3000.00	7.16E+01
0---------- 50 PERCENT LEVEL ----------			
9	292.50	3000.00	6.80E+01
10	337.50	3000.00	6.68E+01
11	112.50	3000.00	6.68E+01
12	157.50	3000.00	6.13E+01
13	135.00	3000.00	5.93E+01
14	202.50	3000.00	5.61E+01
0---------- 40 PERCENT LEVEL ----------			
15	247.50	3000.00	5.14E+01
16	225.00	3000.00	4.78E+01
0---------- 30 PERCENT LEVEL ----------			
17	0.0	7500.00	3.28E+01
18	90.00	7500.00	2.84E+01

Exhibit E.10 (continued)

0----------	20 PERCENT LEVEL	----------	
19	22.50	7500.00	2.27E+01
20	45.00	7500.00	1.98E+01
21	180.00	7500.00	1.95E+01
22	67.50	7500.00	1.95E+01
23	315.00	7500.00	1.91E+01
24	270.00	7500.00	1.65E+01
25	292.50	7500.00	1.54E+01
26	112.50	7500.00	1.48E+01
27	337.50	7500.00	1.48E+01
28	157.50	7500.00	1.39E+01
0----------	10 PERCENT LEVEL	----------	
29	135.00	7500.00	1.35E+01
30	202.50	7500.00	1.27E+01
31	247.50	7500.00	1.16E+01
32	225.00	7500.00	1.09E+01

Exhibit E.11

1 FRACTIONAL CONTRIBUTION OF EACH SOURCE TO THE ANNUAL AVERAGE GROUND LEVEL AIR CONCENTRATION OF POLLUT 1
AT THE SEGMENT CENTROIDS LOCATED 7500.00 METERS FROM THE ORIGIN AT THE SAMPLE SITE FOR THE USERS GUIDE

CENTROID DIRECTION, DEGREES FROM NORTH	STACK SOURCE	AREA SOURCE
0.0	0.1116	0.8884
22.50	0.1096	0.8904
45.00	0.1089	0.8911
67.50	0.1082	0.8918
90.00	0.1123	0.8877
112.50	0.1117	0.8883
135.00	0.1104	0.8896
157.50	0.1112	0.8888
180.00	0.1111	0.8889
202.50	0.1084	0.8916
225.00	0.1091	0.8909
247.50	0.1052	0.8948
270.00	0.1091	0.8909
292.50	0.1068	0.8932
315.00	0.1084	0.8916
337.50	0.1049	0.8951

Exhibit E.12

1 ANNUAL AVERAGE EXPOSURES (PERSON-MICROGRAMS PER CUBIC METER) IN SEGMENTS,
POLLUT 1 EMISSIONS FROM ALL SOURCES AT THE SAMPLE SITE FOR THE USERS GUIDE

	LOCATION OF SEGMENT CENTROID:	
DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 3000.00	7500.00
0.0	5.10E+05	5.49E+05
22.50	1.47E+06	5.05E+05
45.00	6.14E+05	6.81E+05
67.50	2.28E+05	8.49E+05
90.00	4.10E+06	8.23E+05
112.50	1.80E+06	1.54E+05
135.00	4.46E+05	2.71E+05
157.50	1.14E+06	3.38E+05
180.00	5.32E+05	2.90E+05
202.50	7.95E+05	1.56E+05
225.00	3.33E+05	2.33E+05
247.50	7.56E+05	1.06E+05
270.00	1.40E+06	2.96E+05
292.50	2.03E+05	2.85E+05
315.00	4.83E+05	3.61E+05
337.50	9.46E+05	2.51E+05

Exhibit E.13

1 LOCATIONS AND VALUES OF MAXIMUM ANNUAL AVERAGE EXPOSURES TO POLLUT 1

SOURCE	EXPOSURE, PERSON-MICRO-GRAMS PER CUBIC METER	LOCATION OF SEGMENT CENTROID	
		DEGREES FROM NORTH	METERS FROM ORIGIN
STACK SOURCE	3.03E+05	90.00	3000.00
AREA SOURCE	3.80E+06	90.00	3000.00
ALL SOURCES	4.10E+06	90.00	3000.00

1 LOCATIONS AND VALUES OF MINIMUM ANNUAL AVERAGE EXPOSURES TO POLLUT 1

SOURCE	EXPOSURE, PERSON-MICRO-GRAMS PER CUBIC METER	LOCATION OF SEGMENT CENTROID	
		DEGREES FROM NORTH	METERS FROM ORIGIN
STACK SOURCE	1.11E+04	247.50	7500.00
AREA SOURCE	9.47E+04	247.50	7500.00
ALL SOURCES	1.06E+05	247.50	7500.00

Exhibit E.14

1 RELATIVE (TO MAXIMUM) ANNUAL AVERAGE EXPOSURES IN SEGMENTS,
POLLUT 1 EMISSIONS FROM ALL SOURCES AT THE SAMPLE SITE FOR THE USERS GUIDE

	LOCATION OF SEGMENT CENTROID:	
DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 3000.00	7500.00
0.0	0.124	0.134
22.50	0.358	0.123
45.00	0.150	0.166
67.50	0.056	0.207
90.00	1.000	0.200
112.50	0.438	0.038
135.00	0.109	0.066
157.50	0.278	0.082
180.00	0.130	0.071
202.50	0.194	0.038
225.00	0.081	0.057
247.50	0.184	0.026
270.00	0.340	0.072
292.50	0.049	0.070
315.00	0.118	0.088
337.50	0.231	0.061

Exhibit E.15

1 RANKING OF ANNUAL AVERAGE EXPOSURES TO POLLUT 1 IN SEGMENTS, ALL SOURCES AT THE SAMPLE SITE FOR THE USERS GUIDE

RANK	LOCATION OF CENTROID		CONCENTRATION, MICROGRAMS PER CUBIC METER (CONC. RANK)	POPULATION, PERSONS PER SEGMENT	EXPOSURE, PERSON-MICRO-GRAMS PER CUBIC METER
	DEGREES FROM NORTH	METERS FROM ORIGIN			
1	90.00	3000.00	1.22E+02 (2)	33710.	4.10E+06
0**********			90 PERCENT LEVEL		**********
0**********			80 PERCENT LEVEL		**********
0**********			70 PERCENT LEVEL		**********
0**********			60 PERCENT LEVEL		**********
0**********			50 PERCENT LEVEL		**********
2	112.50	3000.00	6.68E+01 (11)	26922.	1.80E+06
0**********			40 PERCENT LEVEL		**********
3	22.50	3000.00	9.89E+01 (3)	14834.	1.47E+06
4	270.00	3000.00	7.16E+01 (8)	19509.	1.40E+06
0**********			30 PERCENT LEVEL		**********
5	157.50	3000.00	6.13E+01 (12)	18566.	1.14E+06
6	337.50	3000.00	6.68E+01 (10)	14162.	9.46E+05
7	67.50	7500.00	1.95E+01 (22)	43606.	8.49E+05
8	90.00	7500.00	2.84E+01 (18)	28942.	8.23E+05
0**********			20 PERCENT LEVEL		**********
9	202.50	3000.00	5.61E+01 (14)	14178.	7.95E+05
10	247.50	3000.00	5.14E+01 (15)	14704.	7.56E+05
11	45.00	7500.00	1.98E+01 (20)	34388.	6.81E+05
12	45.00	3000.00	8.63E+01 (5)	7117.	6.14E+05
13	0.0	7500.00	3.28E+01 (17)	16748.	5.49E+05
14	180.00	3000.00	8.28E+01 (6)	6418.	5.32E+05
15	0.0	3000.00	1.36E+02 (1)	3737.	5.10E+05
16	22.50	7500.00	2.27E+01 (19)	22205.	5.05E+05
17	315.00	3000.00	8.11E+01 (7)	5955.	4.83E+05
18	135.00	3000.00	5.93E+01 (13)	7518.	4.46E+05

Exhibit E.15 (continued)

0********** 10 PERCENT LEVEL **********

19	315.00	7500.00	1.91E+01 (23)	18937.	3.61E+05
20	157.50	7500.00	1.39E+01 (28)	24214.	3.38E+05
21	225.00	3000.00	4.78E+01 (16)	6960.	3.33E+05
22	270.00	7500.00	1.65E+01 (24)	17974.	2.96E+05
23	180.00	7500.00	1.95E+01 (21)	14908.	2.90E+05
24	292.50	7500.00	1.54E+01 (25)	18519.	2.85E+05
25	135.00	7500.00	1.35E+01 (29)	20023.	2.71E+05
26	337.50	7500.00	1.48E+01 (27)	16932.	2.51E+05
27	225.00	7500.00	1.09E+01 (32)	21363.	2.33E+05
28	67.50	3000.00	8.65E+01 (4)	2637.	2.28E+05
29	292.50	3000.00	6.80E+01 (9)	2984.	2.03E+05
30	202.50	7500.00	1.27E+01 (30)	12221.	1.56E+05
31	112.50	7500.00	1.48E+01 (26)	10389.	1.54E+05
32	247.50	7500.00	1.16E+01 (31)	9146.	1.06E+05

Exhibit E.16

1 FRACTIONAL CONTRIBUTION OF EACH SOURCE TO THE ANNUAL AVERAGE EXPOSURE TO POLLUT 1
AT THE SEGMENTS LOCATED 3000.00 METERS FROM THE ORIGIN AT THE SAMPLE SITE FOR THE USERS GUIDE

DIRECTION, DEGREES FROM NORTH	STACK SOURCE	AREA SOURCE
0.0	0.0751	0.9249
22.50	0.0710	0.9290
45.00	0.0680	0.9320
67.50	0.0663	0.9337
90.00	0.0739	0.9261
112.50	0.0726	0.9274
135.00	0.0727	0.9273
157.50	0.0726	0.9274
180.00	0.0716	0.9284
202.50	0.0671	0.9329
225.00	0.0696	0.9304
247.50	0.0649	0.9351
270.00	0.0690	0.9310
292.50	0.0657	0.9343
315.00	0.0685	0.9315
337.50	0.0611	0.9389

Exhibit E.17

1 SUMMARY OF EXPOSURES TO 530426. PERSONS TO POLLUT 1
AT THE SAMPLE SITE FOR THE USERS GUIDE

SOURCE	COLLECTIVE EXPOSURE, PERSON-MICROGRAMS PER CUBIC METER	AVERAGE INDIVIDUAL EXPOSURE, MICROGRAMS PER CUBIC METER
STACK SOURCE	1.79E+06	3.37E+00
AREA SOURCE	2.01E+07	3.79E+01
ALL SOURCES	2.19E+07	4.13E+01

Exhibit E.18

1 SUMMARY OF EXPOSURES TO POLLUT 1 WITHIN AZIMUTHAL SECTORS AT THE SAMPLE SITE FOR THE USERS GUIDE

SOURCE	SECTOR ANGLE, DEGREES FROM NORTH	COLLECTIVE EXPOSURE, PERSON-MICROGRAMS PER CUBIC METER	NUMBER OF EXPOSED PERSONS	AVERAGE INDIVIDUAL EXPOSURE, MICROGRAMS PER CUBIC METER
0STACK SOURCE	0.0	9.96E+04	20485.	4.86E+00
	22.50	1.59E+05	37039.	4.31E+00
	45.00	1.16E+05	41505.	2.79E+00
	67.50	1.07E+05	46243.	2.31E+00
	90.00	3.96E+05	62652.	6.32E+00
	112.50	1.48E+05	37311.	3.96E+00
	135.00	6.23E+04	27541.	2.26E+00
	157.50	1.20E+05	42780.	2.81E+00
	180.00	7.03E+04	21326.	3.30E+00
	202.50	7.02E+04	26399.	2.66E+00
	225.00	4.85E+04	28323.	1.71E+00
	247.50	6.02E+04	23850.	2.52E+00
	270.00	1.29E+05	37483.	3.44E+00
	292.50	4.38E+04	21503.	2.04E+00
	315.00	7.22E+04	24892.	2.90E+00
	337.50	8.41E+04	31094.	2.71E+00
0AREA SOURCE	0.0	9.59E+05	20485.	4.68E+01
	22.50	1.81E+06	37039.	4.89E+01
	45.00	1.18E+06	41505.	2.84E+01
	67.50	9.70E+05	46243.	2.10E+01
	90.00	4.53E+06	62652.	7.23E+01
	112.50	1.80E+06	37311.	4.84E+01
	135.00	6.54E+05	27541.	2.38E+01
	157.50	1.36E+06	42780.	3.17E+01
	180.00	7.52E+05	21326.	3.52E+01
	202.50	8.81E+05	26399.	3.34E+01
	225.00	5.17E+05	28323.	1.82E+01
	247.50	8.02E+05	23850.	3.36E+01
	270.00	1.56E+06	37483.	4.17E+01
	292.50	4.45E+05	21503.	2.07E+01
	315.00	7.72E+05	24892.	3.10E+01
	337.50	1.11E+06	31094.	3.58E+01

Exhibit E.18 (continued)

0ALL SOURCES	0.0	1.06E+06	20485.	5.17E+01
	22.50	1.97E+06	37039.	5.32E+01
	45.00	1.29E+06	41505.	3.12E+01
	67.50	1.08E+06	46243.	2.33E+01
	90.00	4.93E+06	62652.	7.86E+01
	112.50	1.95E+06	37311.	5.23E+01
	135.00	7.17E+05	27541.	2.60E+01
	157.50	1.48E+06	42780.	3.45E+01
	180.00	8.22E+05	21326.	3.85E+01
	202.50	9.51E+05	26399.	3.60E+01
	225.00	5.65E+05	28323.	2.00E+01
	247.50	8.62E+05	23850.	3.62E+01
	270.00	1.69E+06	37483.	4.52E+01
	292.50	4.88E+05	21503.	2.27E+01
	315.00	8.44E+05	24892.	3.39E+01
	337.50	1.20E+06	31094.	3.85E+01

Exhibit E.19

1 SUMMARY OF EXPOSURES TO POLLUT 1 WITHIN RADIAL BANDS
AT THE SAMPLE SITE FOR THE USERS GUIDE

SOURCE	DISTANCE TO CENTER OF BAND, METERS	COLLECTIVE EXPOSURE, PERSON-MICROGRAMS PER CUBIC METER	NUMBER OF EXPOSED PERSONS	AVERAGE INDIVIDUAL EXPOSURE, MICROGRAMS PER CUBIC METER
0STACK SOURCE	3000.00	1.11E+06	199911.	5.57E+00
	7500.00	6.73E+05	330515.	2.04E+00
0AREA SOURCE	3000.00	1.46E+07	199911.	7.32E+01
	7500.00	5.47E+06	330515.	1.66E+01
0ALL SOURCES	3000.00	1.57E+07	199911.	7.88E+01
	7500.00	6.15E+06	330515.	1.86E+01

Exhibit E.20

1 SUMMARY OF EXPOSURES TO GROUND-LEVEL AIR CONCENTRATION LEVELS OF POLLUT 1
EMITTED FROM ALL SOURCES AT THE SAMPLE SITE FOR THE USERS GUIDE

AIR CONCENTRATION		NUMBER OF PERSONS EXPOSED TO		EXPOSURE (PERSON-MICROGRAMS PER CUBIC METER) TO	
LEVEL, % OF MAX.	MINIMUM VALUE, MICROGRAMS PER CUBIC METER	DESIGNATED LEVEL	DESIGNATED OR HIGHER LEVEL	DESIGNATED LEVEL	DESIGNATED OR HIGHER LEVEL
90-100	1.23E+02	3737.	3737.	5.10E+05	5.10E+05
80- 90	1.09E+02	33710.	37447.	4.10E+06	4.61E+06
70- 80	9.55E+01	14834.	52281.	1.47E+06	6.08E+06
60- 70	8.19E+01	16172.	68453.	1.37E+06	7.45E+06
50- 60	6.82E+01	25464.	93917.	1.88E+06	9.33E+06
40- 50	5.46E+01	84330.	178247.	5.33E+06	1.47E+07
30- 40	4.09E+01	21664.	199911.	1.09E+06	1.57E+07
20- 30	2.73E+01	45690.	245601.	1.37E+06	1.71E+07
10- 20	1.36E+01	222072.	467673.	4.01E+06	2.11E+07
0- 10	0.0	62753.	530426.	7.65E+05	2.19E+07